JUNE 1957

TOOLING & PRODUCTION

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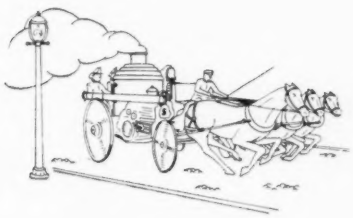


Galloping Obsolescence

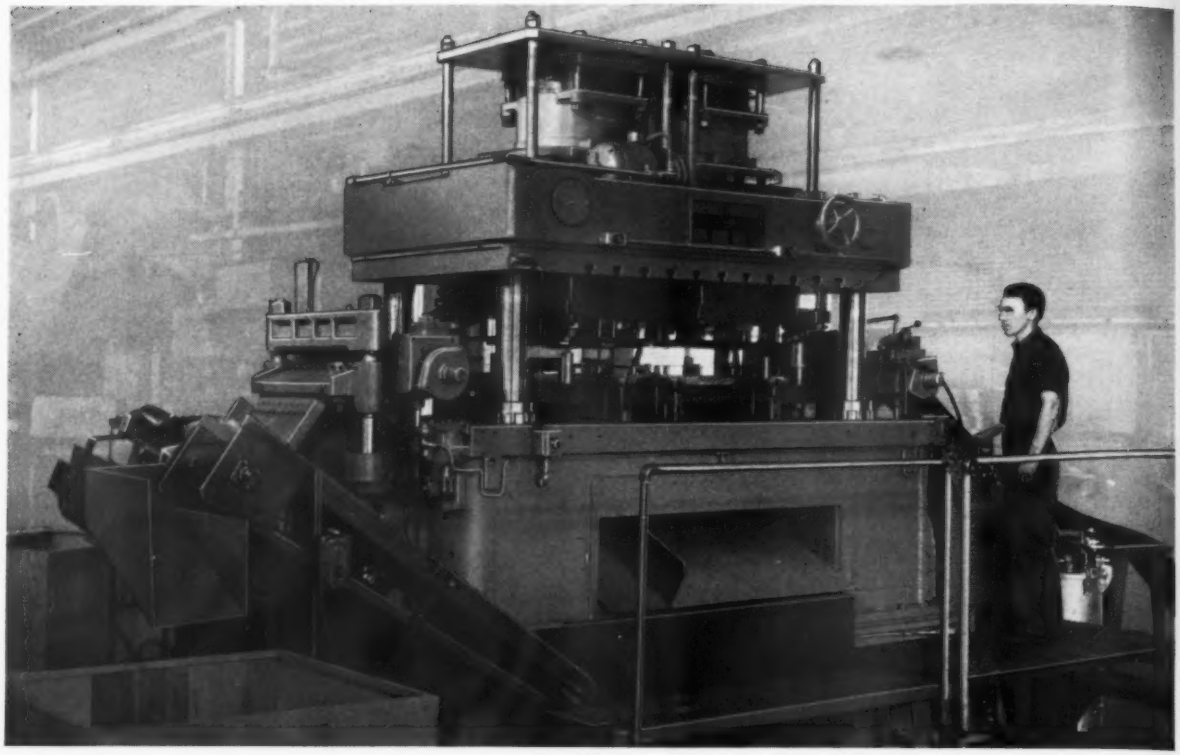
by Jerome A. Raterman
President
MONARCH MACHINE TOOL CO.

and President
NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION

I UNDERSTAND THAT IT IS TRADITIONAL for the current President of the National Machine Tool Builders' Association to address this Forum. I presume, therefore, that each year our President remarks about the vital contribution of electrical engineering to the machine tool industry, and our common partnership on behalf of modernization and improvement. Nevertheless, I want to emphasize it again.

The title of my talk is "Galloping Obsolescence." Well, your industry and mine, working together, are certainly making it gallop. Your developments, especially in the field of controls, have enabled machine tool

. . . *Continued on Page 44*



Henry & Wright Double Crank

"definitely improved our competitive position"

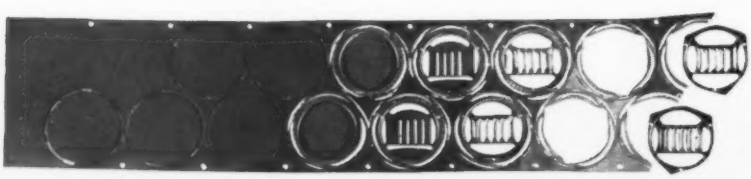
TO KEEP PACE with trends in progressive stamping, Grand Haven Stamped Products Co., Grand Haven, Mich., bought a 100-ton Single Crank Henry & Wright in 1954. Its performance was so impressive, Grand Haven purchased a 200-ton Double Crank in 1956.

ON VERY FIRST JOB the new machine equalled expectations. The part involved — an automotive vent grill — is produced two at a time on a multi-station die from a 15⅝" strip of 22-gauge, cold-rolled steel, at 124 pieces per minute.

THREE OR FOUR conventional presses would have been required to produce this part, it is estimated by Emil Gaul, Grand Haven vice president. Among the features he likes about the Double Crank are: unequalled flexibility afforded by the large bed area, rapidity of die change, inching control and safety devices.

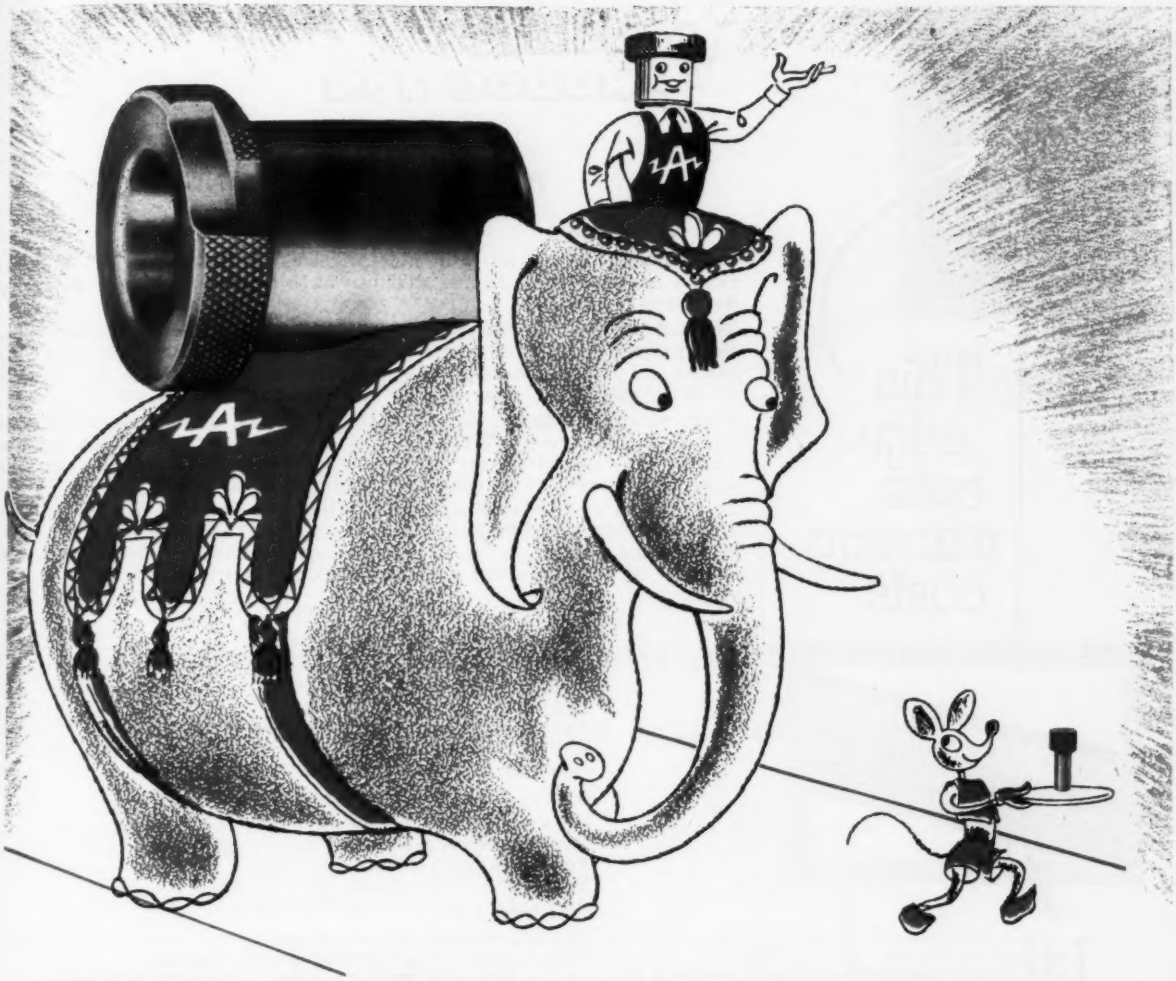
"Definitely improved our competitive position," is the way Mr. Gaul sums up the performance of his Henry & Wrights. They can improve productivity and work quality in your plant, too. Write for our catalog.

HENRY & WRIGHT
Division of Emhart Mfg. Co.
Hartford, Connecticut



Six- and seven-station twin die lances, flattens, draws, pierces, forms and blanks out.

CIRCLE INFORM-A-GRAM KEY NO. 2



THERE'S NO LARGER RANGE OF STANDARD BUSHING SIZES THAN American's!

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. . . others have copied but never equalled our KING SIZE selection! . . . for high speed delivery of precision drill jig bushings — smallest to the largest, or specials to your order, specify American. There's an exclusive American Distributor near you.

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DRILL BUSHING CO.
5107 PACIFIC BOULEVARD
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FROM THE SMALLEST TO THE LARGEST, THE RIGHT DRILL BUSHING IS AN AMERICAN DRILL BUSHING

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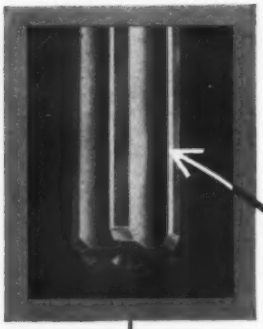

This edge cuts reaming costs

L+I gives you the edge on production

Call your L+I distributor

The Reamer Specialists

L&I

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

JUNE 1957

VOL. XXIII—No. 3

GEORGE J. HUEBNER, Founder

PERSONALLY SPEAKING

Dear T&P Reader:

It certainly is wonderful to be able to read. My greatest regret is that I cannot read five times as fast and thus have the opportunity of absorbing five times as much.

The morning mail is a wonderful source of reading matter. It brings many informative and valuable letters, publications, and advertisements. It brings orders that make us happy. It brings information that helps in our daily work. Occasionally it has to bring news which makes us sad.

Then, sometimes there's something really unusual and totally unexpected like the poem I received a few days ago from my good friend, Bob Newton, a well known manufacturers' representative here in Cleveland. I hope you'll enjoy the pleasant philosophy of this poem as much as I did.

Perhaps you won't recognize yourself in this poem as I do. I know, though, from long years of association with industry, that T&P readers are dedicated to "building bridges" for their co-workers, their families, friends and customers. So, to see yourself as others should see you, read

The Bridge Builder

An old man going a lone highway
Came in the evening, cold and gray
To a chasm vast, both deep and wide.
The old man crossed in the twilight dim —
The swollen stream had no fears for him,
But he stopped when safe on the further side,
And built a bridge to span the tide.

"Old man," said a fellow pilgrim near,
"You're wasting your strength in labor here.
Your journey will end with the closing day,
You never again will pass this way.
You've crossed the chasm deep and wide —
Why build you this bridge at eventide?"

The laborer lifted his old gray head.
"Good friend in the way I have come," he said,
"There followeth after me today
A youth whose feet must pass this way.
This chasm which has been as nought to me
To that fair-haired youth might a pitfall be.
He, too, must cross in the twilight dim.
Good friend, I am building this bridge for him."

Author unknown

Cordially yours,

Ray Huebner

Publisher

TOOLING & PRODUCTION

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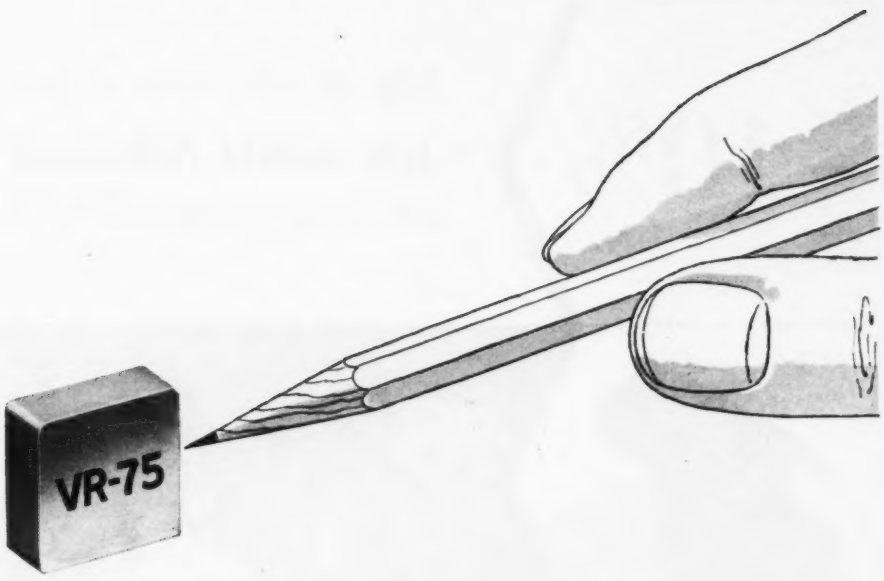


. . . a new Super Steel-Cutting Carbide Grade

field-proven on all types of work!

1½ to 2½ times greater tool life on crankshaft cheeking. Material SAE 1145 steel forging, 217-251 Brinell. Feed .013, SFPM 250. Toolholder with triangular full length insert. Severe interrupted cut.

Carbide	Insert life, average
Premium Grade "A"	125 pieces per corner
Premium Grade "B"	188 pieces per corner
VR-75	324 pieces per corner

81% greater tool life turning *Arma-steel forging*, 35-38 Rockwell C. Machine, Sundstrand automatic; feed .010; SFPM 400; depth of cut ⅛"—¼"; toolholder with triangular throw-away insert.

Carbide	Pieces Per Corner		
	Min.	Max.	Aver.
Premium Grade "B"	68	122	85
VR-75	115	211	160

Tool life doubled turning spline coupling. Machine, New Britain copy lathe; feed .020; speed 940 rpm; depth of cut 3/16". Negative rake toolholder with triangular throw-away insert.

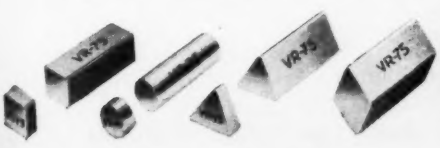
Carbide	Pieces per corner
Premium Grade "B"	120 average
VR-75	240 average

4 to 1 tool life turning spline end of axle shaft. Machine, Bullard Man-Au-Trol; material SAE 1330 steel, 340-360 Brinell; speed 290 sfpm; feed .0133. Toolholder with triangular long insert.

Carbide	Pieces per corner	Edge Wear
Premium Grade "A"	45	.050
VR-75	187	.040

AVAILABLE NOW in throw-away and long inserts for negative rake toolholders. Ask for Bulletin No. 572.

Call your V-R representative or distributor or write.



Vascoloy-Ramet Corporation

Subsidiary of Fansteel Metallurgical Corporation
874 S. Market St., Waukegan, Illinois

C-626

CIRCLE INFORM-A-GRAM KEY NO. 5

-40%

"Job costs reduced up to 40%

with our two BURGMASTER® turret drills"

So states The H. K. Porter Company, Somerville, Mass.

As the illustration shows, they use one operator to handle two Model 2BH Burgmaster 6-spindle automatic hydraulic turret drills. The part (cross sectional views of 2 sides shown) is an 1117 steel forging and the work on this job consists of a total of 22 operations involving drilling, tapping, reaming, counterboring and countersinking. The operator reports close concentricity held on all operations with good finish and depth control and with plenty of time to inspect work while machines are running. Setup time is reduced and greatly simplified.

AUTOMATIC HYDRAULIC BURGMASTERS (6- and 8-spindle models) feature skip indexing, automatic cycling and infinitely variable preselective feeds. All models (automatics, manuals, radials) provide power indexing, preselective spindle speeds and very close preselective depth control. Capacities from ⅜" to 1½" available.

For complete details, write Dept. **TP-6**

BURG TOOL

Manufacturing Company, Inc.

15001 South Figueroa Street, Gardena, California

RIDGEWOOD, N. J. • CHICAGO • CLEVELAND • DETROIT • SAN LEANDRO, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 6

You don't need to clean your spindles or draw tubes for over a year when you use...

BENCO COLLETS

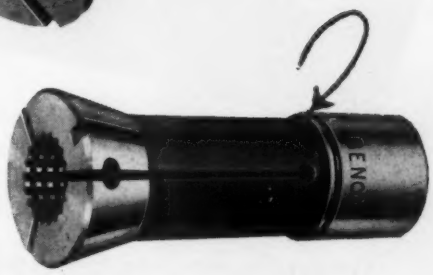
with the "O" ring seal

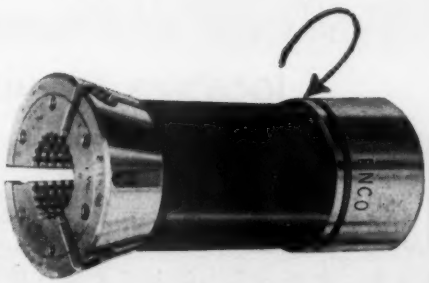
The above statement is true! We've proved it in our own plant, where the conditions and machines are much the same as in any shop today. The simple little "O" ring seal in the Benco Collet is the most efficient method ever discovered for preventing dirt and chips from getting between the draw tube and spindle wall, and into the actuating mechanism at the end of the spindle. It's a money saver and time saver every day and the collets with the "O" ring seal cost you no more than ordinary collets.

This is only one outstanding feature of the Benco line of Solid and Master Collets. Benco precision collet manufacturing methods applied to selected alloy steel, followed by careful heat treating and rigid inspection guarantee better production from your machines.

Benco Collets are stocked in a large range of sizes for all popular makes of automatics. Select them every time...you just can't get better quality, performance or value!

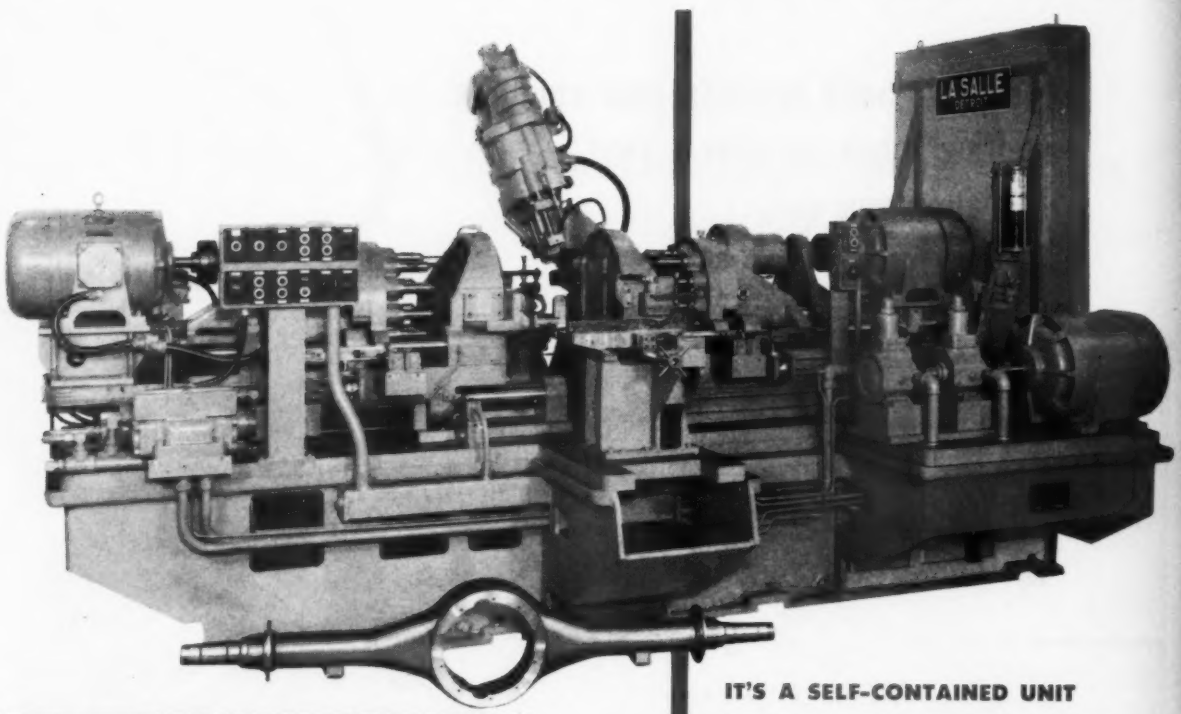
Write for new catalog.





BENCO **COLLET MANUFACTURING CO.**
Cleveland 14, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 7



La Salle adjustomatic

processes any one of 6 different rear axle housings automatically -with no additional locaters required

IT'S A SELF-CONTAINED UNIT

It can be re-positioned anywhere without tear-down or re-assembly. Everything is built-in!

ANYONE CAN INSTALL IT

All electrical and hydraulic hook-ups have been eliminated. Merely plug in and start using.

DRILLS 21 HOLES—AUTOMATICALLY

20 holes in each housing—10 from each side, and, 1 vent hole—all drilled automatically.

ADJUSTMENTS ARE SIMPLE

There's a direct gage setting for each of the 6 housings. Set for the one you're handling.

THE VENT HOLE UNIT IS UNIQUE

It's mechanical and cam operated. Likewise, it's adjustable by direct gage setting.

IT'S BUILT TO J.I.C. STANDARDS

Meets J.I.C. Hydraulic and Electrical Standards. And, there's automatic lubrication throughout.

Written requests for information Honored Promptly.

La Salle tool, inc.

ENGINEERING & BUILDING SPECIAL MACHINERY

3840 EAST OUTER DRIVE • DETROIT 34, MICHIGAN

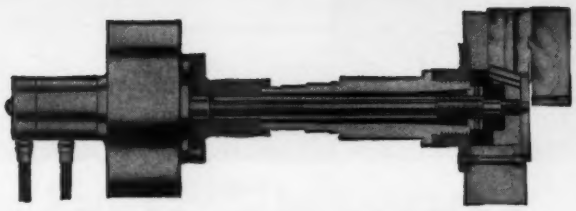
CIRCLE INFORM-A-GRAM KEY NO. 8

Skinner Power Chucks will chalk up immediate savings on your production machines!

Cost-per-piece savings add up to a really important figure for production boring done on this Skinner-equipped Potter & Johnston 3-U Speed-flex automatic chucker. You can give your plant the same kind of savings, too.

Look at that Skinner Power Chuck. It grips and releases instantly — compressed air does the hard work, and does it fast. You can see how much longer it would take to chuck these pieces by hand — time that pushes up costs. Elimination of hand wrenching cuts fatigue way down, too — operators like that.

You'll put your plant in a much better profit position when you equip your production machines with Skinner Power Chucks, because you'll greatly reduce your most important cost factor: overall machining time. Write for Catalog 68P, with complete specifications, applications, and installation instructions. Write Dept. 196



For small lathes, too!

On small lathes, like South Bend, Hardinge, Sheldon, Logan, or Atlas, used on production runs, the Skinner "Junior" Power Chucking Unit will cut costs by saving *time*. Ask for special Bulletin JP67.

Simple, dependable operation.

Skinner's proved-in-service wedge principle guarantees positive, trouble-free operation. Jaws are closed or opened instantly by an actuating wedge, operated by a double-acting air cylinder.

Skinner Power Chucks are available through leading Industrial Distributors everywhere.

SKINNER CHUCKS

THE SKINNER CHUCK COMPANY

ESTABLISHED 1887

NEW BRITAIN, CONNECTICUT

HOW TO INSURE YOUR COSTLY DIES . . .

DON'T buy "bargain-price" special die sets!

When you need a special die set it is usually for an expensive die . . . one that you really should protect.

The few dollars extra you may pay for a "Detroit-built" special are the cheapest insurance you can have that your costly die will get maximum protection.

Believe us—there is a lot more to a good special die set than some steel plate and a few pins and bushings.

The protection your costly dies get from Detroit-built die sets is not accidental. It is built into every die set we make—standard or special—and we've been doing it for 30 years.

Sure, you can buy cheaper die sets, but they can be awfully expensive, too.

OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

Detroit
DIE SET
CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 10

Vinson Steel and Aluminum Co. Dallas, Texas says:

Shearing capacity of this machine is 12'-0" x ½" mild steel. Note accessibility of two cranks on right end housing. Upper crank is for knife adjustment. Lower one is for back gauge adjustment.

Adjustable Blade Clearance Allows Use of Shear for Complete Range of Thicknesses

THE feature that Vinson Steel and Aluminum Company likes best on their Steelweld Shear is the adjustable blade clearance. This permits them to use the one machine for their complete range of thicknesses. They go as low as 26 gauge galvanized material and up to ½ inch mild steel and ½ inch aluminum.

As a leading supplier of metal in North and West Texas, Vinson insists on cuts being sharp, straight and accurate. This requires that the blade clearance be correct for every thickness cut. Because of the unique easy method of adjusting the clearance on Steelweld Shears, the adjustment can be made in seconds.

Another item which is impressive is the low maintenance cost. This machine has been in service for over two years, and the maintenance has been practically nil.

More and more warehouses are installing Steelweld Shears. Usually one will handle a range of work that would require two or more other type machines not built with a fast knife adjustment feature.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

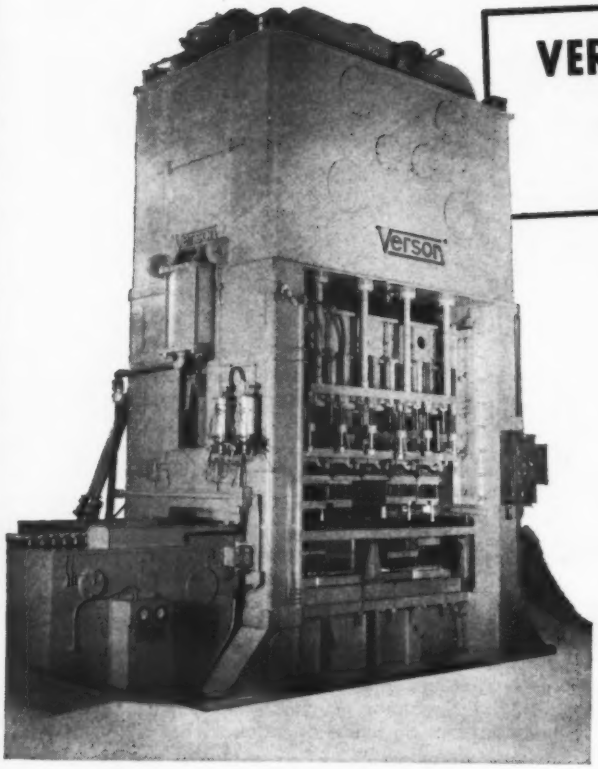
8752 East 281 Street, Wickliffe, Ohio

STEELWELD PIVOTED BLADE SHEARS

CIRCLE INFORM-A-GRAM KEY NO. 11

There is only one primary reason
for buying a Transmat press . . .

LOWER UNIT COSTS WHERE PRODUCTION



TYPICAL 500 TON VERSON TRANSMAT—This is the press that produces the valve covers described at the right. Today's Verson Transmat is the culmination of twenty years of specific development of an automatic process to produce multiple operation stampings. Since the installation of the first Transmat eighteen years ago,* the machine has progressed to the point where there is no limit to tonnage capacity or size of piecepart that can be produced. Transmats as small as 100 tons and as large as 4000 tons have been built.

*Still in service, producing 1300 oil filter shells per hour.

VERSON TRANSMAT PRESSES
are engineered and built
to give you this economy

If you produce any part requiring four or more operations on 4000 or more pieces per day, Verson Transmat Presses offer remarkable opportunities for cost reduction.

The Verson Transmat is designed and built solely for the purpose of producing multi-operation stampings at the lowest possible cost. Design is not compromised in any way that will affect this objective! As a result Verson Transmats offer a combination of advantages available in no other transfer press—

- High speed—20, 25 and even 36 strokes per minute with machines having capacities up to 4000 tons.
- Positive, direct, gear driven transfer mechanism with safety interlocks make misfeeding impossible.
- Non-oscillating feed bars, only the fingers move in and out—fast, smooth action.
- Automatic, delayed action, adjustable stroke knockout cylinders at each station—prevents damage to piecepart by positive stripping and location.
- Individual adjustable wedge slides for precise die adjustment.
- Fully automatic lubrication—two Cascade oil flow systems and two pressure systems.

When you buy a transfer press be sure you get the high production you are paying for. Be sure you get the efficient, trouble-free operation that Verson know-how assures you. Described at the right are a few of the jobs being performed successfully at this moment. We'll be happy to tell you about others . . . and we'll welcome the opportunity to show you what Transmats can do for you. Write or phone.

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

-Verson-

VERSON ALLSTEEL

9335 S. Kenwood Avenue, Chicago 19, Illinois

MECHANICAL AND HYDRAULIC PRESSES • TOOLING • TRANSMAT

CIRCLE INFORM-A-GRAM KEY NO. 12

ON JOBS REQUIREMENTS ARE HIGH

Here's Proof

of what VERSON TRANSMATS can do

These are verified production figures of a few of the Transmats in use in metalworking plants at this moment.

20⅜" x 3⅝" x 2¾"—18 ga. stock.

1,200 VALVE COVERS PER HOUR

Five operations on each, a total of 6,000 press operations per hour. The part is formed from strip. Two such presses are currently in operation, both since 1954.

5" diam. x 2¼"—16 ga. stock.

1,500 MOTOR HOUSINGS PER HOUR

Ten operations on each, a total of 15,000 press operations per hour. The part is formed from strip. One 600 ton Transmat has been in operation for over one year.

7" diam. x 4"—20 ga. stock.

900 HEADLAMP HOUSINGS PER HOUR

Six operations on each, a total of 5,400 press operations per hour. The part is formed from pre-blanked stock. Five 250 ton Transmats of this type are in service, the earliest since 1949.

19½" x 3¾" x 5½"—.1606" stock.

1,000 AXLE HOUSINGS PER HOUR

Seven operations on each, a total of 7,000 press operations per hour. The part is formed from previously developed blanks. Two such 2,200 ton Transmats have been in service for about one year.

PRESS COMPANY

8300 S. Central Expressway, Dallas, Texas

-Verson-

PRESSES • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

CIRCLE INFORM-A-GRAM KEY NO. 13

"the job's half done before it's begun"

with

heinrich

Grip-Master

heinrich
Start with a speedy Grip-Master vise and fixture base.
Simply add false jaws and bushing plate.
Result . . . an accurate, precision-built, low-cost jig.

. . . so, you cut your cost of tooling

up to **75%**

MORE and more tool engineers like the engineer pictured above are turning to Heinrich Grip-Master jig and fixture bases as a simple means of cutting tooling costs. The Heinrich formula requires less designing time, less tooling time, and less material. The patented screwless design and circle-grip locking mechanism means faster setting and gripping—speedy loading and unloading for rapid fire production.

To further assist the busy tool engineer, Heinrich provides free templates to speed designing time.

The Grip-Master is available in four sizes to meet all tooling needs.

NO NEED FOR OLD FASHIONED, EXPENSIVE, CUMBERSOME JIG BOXES.
WHEN YOU USE THE GRIP-MASTER AS A JIG AND FIXTURE BASE SHOWN HERE.
Positive locking guaranteed
Moves freely for instant jaw setting

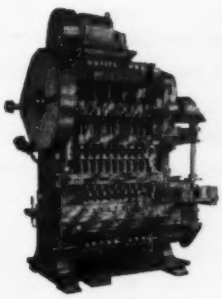
heinrich

TOOLS, INC.
dept. 137-F
RACINE, WISCONSIN

Write for FREE catalog and templates

For Automation In Pressworking
THINK OF WATERBURY FARREL

"Waterbury" Transfer Presses

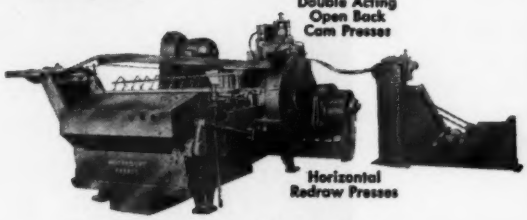

Cam and Crank Eyelet Machines

Four Post Blanking Presses

High Speed Blankers

Double Acting Open Back Cam Presses

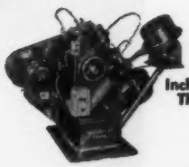
Single Acting Open Back Bench Presses

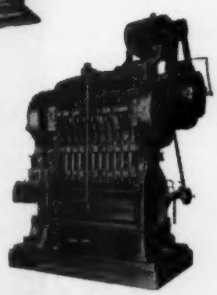

Horizontal Redraw Presses

Waterbury Farrel's extraordinary range of press-building experience encompasses a wide variety of single and multiple operation presses. These include virtually every commercial type up to 600 ton capacity.
In addition, Waterbury Farrel has successfully engineered automated press output by combining presses, feeds, hoppers, straighteners, coil holders, scrap choppers, scrap winders, finger motions, attachments for side piercing, blank turning, stripper release, and blank holding mechanisms into production-team units.

Write for free catalogs on specific types of presses or contact your nearest Waterbury Farrel office today.

THE WATERBURY FARREL FOUNDRY & MACHINE CO. Waterbury, Conn.
Sales Offices: Chicago • Cleveland • Millburn, N. J.


Inclined Shell Threaders


Multiple Plunger Pillar Presses

COLLAPSIBLE TUBE EQUIPMENT
Knuckle Joint Presses
Tube Cap Machinery
Tube Trimming Lathes

HIGH SPEED PRESSES
Two Post Blanking
Four Post Blanking

MULTIPLE STATION MACHINES
Cam Eyelet
Crank Eyelet
Multiple Plunger
Pillar Presses
Transfer Presses
Horizontal
Redraw Presses

OPEN BACK PRESSES
Double Acting Cam
Double Acting Crank
Geared
Single Acting Crank

PILLAR PRESSES
Double Acting Cam
Double Acting Crank
Geared Pillar
Single Acting Crank

SMALL PRESSES
Foot
Hand
Safety Bench
Single Acting
Open Back Bench

SINGLE AND DOUBLE GEARED ARCH DRAWING PRESSES THREADERS
Inclined Shell Threaders
Screw Cap Thread Rolling Machines

MINT COINING PRESSES LATHES
Edging, Trimming and Knurling Lathes

AMMUNITION AND CARTRIDGE MACHINERY
Arbor Lathes

MISCELLANEOUS
Coil Holders
Coil Holders and Roll Straightener Units
Roll Straighteners
Unwinding Device
Gang Slitters

WF-34

Bolt, Nut & Screw Machinery | Power Presses | Rolling Mill Machinery | Wire Mill Equipment | Sendzimir Mills and other Special Machinery

WATERBURY FARREL FOUNDED 1851

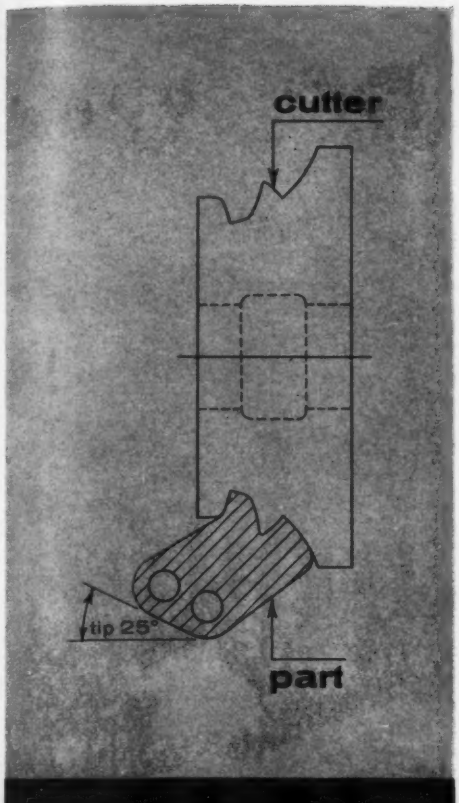
CIRCLE INFORM-A-GRAM KEY NO. 15

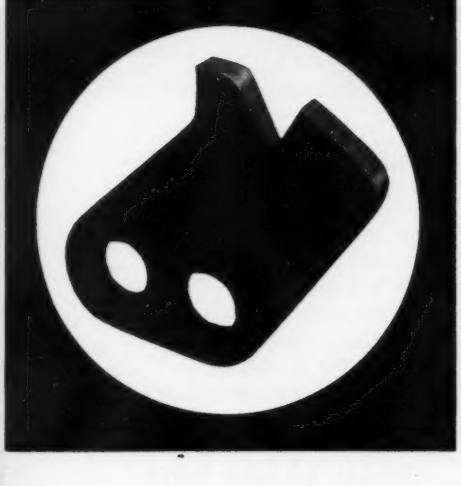
top cutter design
saves 50% in cutter cost,
reduces cutter breakage

BARBER-COLMAN recommends:

a single solid form relieved cutter to replace two former cutters

improved design to increase tool life and reduce cutter breakage





This Barber-Colman unground form-relieved milling cutter takes the place of two milling cutters formerly operated as a gang for milling these lever sectors. The proportions of the cutter were improved by reducing the cutter diameter and increasing the bore diameter. These improved proportions provide greater rigidity in the cutter and in the milling operation. As a result, initial cutter cost has been reduced 50%, and cutter cost-per-piece further reduced through extended tool life and reduced breakage.

The form on the workpiece is located with respect to the cutter axis to allow sufficient clearance behind all cutting edges. In this particular application, the workpiece is positioned at 25° relative to the cutter axis, permitting the manufacture of a one-piece cutter with adequate cutting clearance.

The material in the part is soft steel of maximum machineability. For best cutting efficiency, the cutter was designed with adequate clearance for milling this material. Cutters are 5″ diameter with 1¼″ bore as compared with previous cutters of 6″ diameter and 1″ bore.

Replacement with a single form relieved cutter has simplified cutter resharpening and reduced cost-per-piece. All Barber-Colman form relieved cutters are index sharpened across the face of the teeth. Cutters are simply and easily resharpened on conventional equipment or Barber-Colman automatic hob and cutter sharpening machines.

With Barber-Colman improved cutter design, pieces are milled at the rate of 3½″ per minute feed, and 150 R.P.M. cutter speed. Tool life averages 3,000 pieces per sharpening.

If you are seeking ways to improve your milling cutter efficiency, consult Barber-Colman cutter engineers. Their skill and experience in applying advance cutter design features will help to solve your milling problems.

BARBER-COLMAN COMPANY

8106 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN

CIRCLE INFORM-A-GRAM KEY NO. 17

AVOID the **HIGH COST** and difficulty of fabricating long, hard & straight parts by conventional methods . . .

THOMSON

60 Case

hardened and ground

SHAFTS, ROLLS, GUIDE RODS and other long-round parts

60 Case is the result of over ten years of experimental work and production experience with hardened and ground shafts which are a requirement for BALL BUSHINGS, the Linear Ball Bearing manufactured by Thomson Industries, Inc.

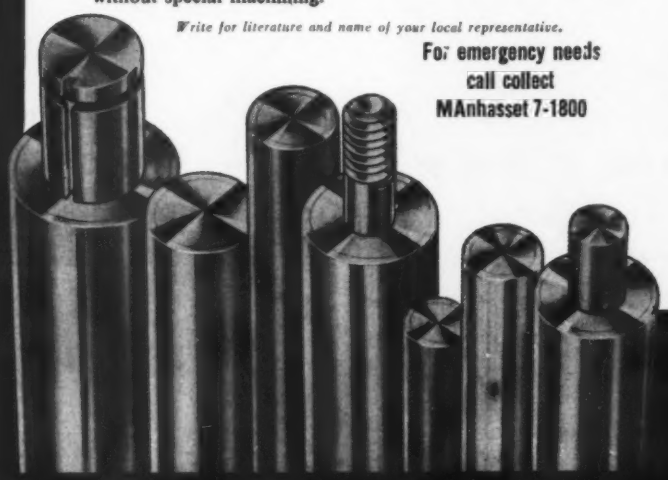
The special techniques and equipment that have been developed enable high production rates and low handling costs. This permits big savings over conventional methods which are plagued with erratic warpage, straightening and resultant grinding problems. Finished *60 Case* parts frequently cost less than the scrap losses that result from conventional methods.

60 Case material has a surface hardness close to 60 on the Rockwell C scale which is essential to resist wear.

Long lengths of material ranging in diameter from ¼" to 4" are stocked to enable prompt shipment of *60 Case* parts, with or without special machining.

Write for literature and name of your local representative.

For emergency needs call collect MAnhasset 7-1800



ADVANTAGES of *60 Case*

- COST REDUCTION
- HARD BEARING SURFACE
- ACCURATE DIAMETERS
- GROUND FINISH
- STRAIGHT PARTS
- DELIVERY FROM STOCK
- ADDED STRENGTH
- UNIFORM HIGH QUALITY

TYPICAL *60 Case* PARTS

GUIDE RODS, SHAFTING, ROLLS, TRAVERSE RAILS, PISTON RODS, ARBORS, LEADER PINS, TIE RODS, KING PINS, AXLES, CONTROL RODS, GUIDE POSTS, MANDRELS, BEARING ROLLERS, SPINDLES

THOMSON INDUSTRIES, Inc.
Dept. C1, Manhasset, New York

"This used to take hours...

now the whole gearcase comes off in minutes!" Quite an accomplishment for an enclosed eccentric press. Too often the advantages of the enclosed design are gained by sacrificing the accessibility of the open design. Not so with Bliss, however: Bliss engineers count practical maintenance a design "must"—any new design that comes off the boards at Bliss keeps the maintenance man in mind.

Which is one more reason why industry agrees, "Bliss is more than a name ...it's a guarantee."

BLISS
SINCE 1857

E. W. BLISS COMPANY · Canton, Ohio

100 years of making metal work for mankind

PRESSES • ROLLING MILLS • MILL ROLLS • DIE SETS • CAN MACHINERY • ORDNANCE

CIRCLE INFORM-A-GRAM KEY NO. 19

NIAGARA HAS THEM!

SERIES A, 5½-110 tons

SERIES AA, 32-200 tons

SERIES E, 75-200 tons
Front-to-Back Crankshaft

READILY EQUIPPED TO HANDLE

14 pt. Mechanical Sleeve | 18 pt. Electro-Pneumatic Sleeve | Electro-Pneumatic Friction | Single Cylinder | Tandem Type

THREE TYPES OF CLUTCHES

Each Niagara Inclinable features the clutch best suited for the purpose. (1) Famed Niagara multi-jaw mechanical sleeve clutch. (2) Exclusive Niagara multi-jaw Electro-Pneumatic sleeve clutch. (3) Niagara low inertia Electro-Pneumatic friction clutch.

FOUR TYPES OF DIE CUSHIONS

Designed and manufactured by Niagara, single cylinder and tandem type pneumatic die cushions are built in 4 types to make any Niagara Inclinable a double action press. Self-lubricating models are available for automated OBI's.

SPECIAL BOLSTER PLATES
J.I.C. CONTROLS FLANGED SLIDES
POWER SLIDE ADJUSTMENT
FLYWHEEL BRAKE
DIE AREA LIGHTING
MOTOR CUTOUT SWITCH

EQUIPPED FOR AUTOMATION

Featuring the most advanced controls and devices, Series EA (automated models) are engineered for peak productive capacity. Here's a line of OBI's that is completely equipped by Niagara for operation in your automation lines.

POWER INCLINING DEVICE

Fast-acting, safe and easy to operate, Niagara's air motor inclining device (shown above) is furnished as an optional accessory.

WIDE CHOICE OF ACCESSORIES

With a full selection of modern press accessories available, Niagara Standard Inclinables are adaptable to the widest possible range of job assignments.

standard OBI presses in all sizes and types that are right for you!

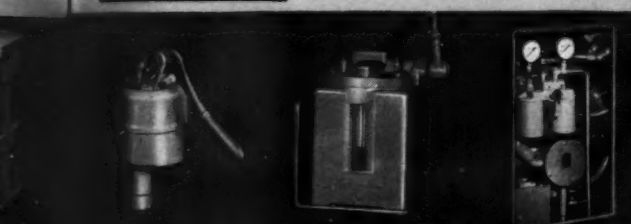
5 LINES 34 MODELS
EACH A CHAMPION IN ITS CLASS:

Niagara offers you industry's most complete, most modern, and most exclusive selection of standard inclinables . . . plus an unequaled choice of press accessories and automatic devices to meet your specific job requirements. You can count on Niagara for inclinables that will do the most to speed production, assure accuracy, prolong die life and hold down maintenance costs within your plant.

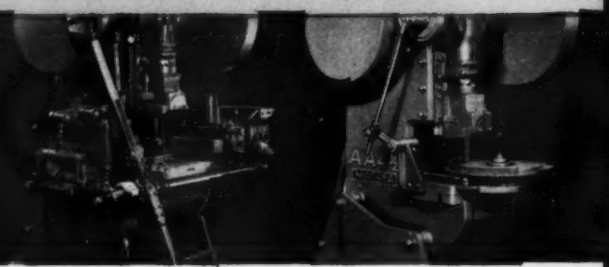
SERIES EA (Automated), 75-200 tons
Front-to-Back Crankshaft

SERIES BI, 60-200 tons
Double Crank

YOUR WORK MOST PROFITABLY



Manual Automatic Automatic Circulating



CENTRALIZED LUBRICATION TO FIT THE NEED

Niagara Inclinables are readily equipped with either manually-operated or automatic lubricators, or automatic circulating oil systems. It's one of the many ways in which Niagara outfits standard inclinables to meet individualized requirements.

ALL TYPES OF AUTOMATIC FEEDS

To speed production, Niagara Inclinables are easily equipped with complete, automatic feed arrangements: single roll, double roll, dial, chute, magazine and specially engineered types. Variable speed drives can be provided to allow adjustment for the optimum speed consistent with the die, material and feed length.

NIAGARA

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

GET ALL OF THE FACTS on any or all Niagara Inclinable Presses. Consult with a Niagara representative. His recommendation will be impartial. He has all types of OBI's to offer. At your request, specific Bulletins on each series, containing complete information and specifications, will be mailed to you promptly

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES:

Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia

Distributors in principal U. S. cities and major foreign countries

HARDINGE
ELMIRA, N.Y.

Variable Speed Machine
for
PRODUCTION DEPARTMENTS

Produce More Precision Parts at Lower Cost with this NEW Second Operation Machine

Send for Free illustrated Bulletin DSM59

HARDINGE BROTHERS, INC., ELMIRA, N. Y. U.S.A.

OFFICES IN PRINCIPAL CITIES. Export office: 269 Lafayette St., New York 12, New York

CIRCLE INFORM-A-GRAM KEY NO. 22

"Commendable Comments"

"Effective use of the creative man requires an understanding and tolerant attitude which recognizes that ideas can be more important than facts; and imagination, even intuition, more important than logic."

—Dr. John T. Rettaliata, president of Illinois Institute of Technology, at the recent National Industrial Research Conference in Chicago.

"Theoretically, the purpose of an economy drive is to promote greater efficiency, but that purpose quickly gets lost in the confusion, because everything within striking distance gets 'economized.' It ignores the basic fact that you make money by spending money—spending it intelligently."

—Don G. Mitchell, chairman of the board and president, Sylvania Electric Products, Inc., at the West Coast General Management Conference of the American Management Association.

"One-half of our national product is produced in job shops. Automation is just as practical — and necessary — in these operations as it is in larger industries."

—Charles Kerner, assistant vice president and works manager, Industrial & Marine Division, Walter Kidde & Co., Inc., at the annual meeting of the Fire Equipment Manufacturers' Association.

"The higher speeds — which will be many times over those presently available in our combat aircraft—the higher altitudes which will be at least double today's — fully automatic controls which will be much more precise and reliable than we are now using — all will have their impact on facilities, production equipment and processes, manpower, and materials. . . . The sizes, shapes, and tolerances required will demand increased automation and numerical control over machine operations. We will have to use particularly in small machines, more and more automatically controlled operations of great flexibility and accuracy, programmed through mathematical analysis of engineering data."

—The Honorable Dudley C. Sharp, assistant secretary of the Air Force, Materiel, in a talk to the Strategic Industries Association in Washington.

"To continue [its] rate of growth, American business must continue to invest a minimum of 40 billion dollars a year in plants and equipment. About five billion dollars of this is for supplying equipment for the new workers who join the labor force each year. Ten billion more must be invested in machines and facilities to provide a normal increase in productivity. About 25 billion dollars are needed for maintaining existing plant and equipment without additions or improvements."

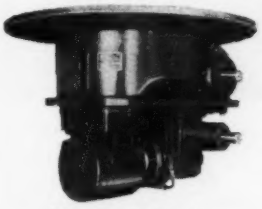
—Ralph E. Cross, executive vice president of The Cross Co.

STANDARDIZED AUTOMATION!

Stock 36″ Intermittor with special jig-bored dial

50% - 100% Increase in Production with FERGUSON HIGH SPEED INDEX TABLES

Up to 30,000 Pieces per Hour



Standard Table and Power Section

Stand and Auxiliary Tool Mounting Plates

The standard Ferguson Intermittor is a *must* for operations such as machining, joining, forming, staking, piercing, assembling, testing and inspection that require a combination of high speeds, long dwell or work time, and smooth indexing.

There is a standard Intermittor for almost every application, offering a choice of stops, dial size, degree of movement; and a table for either extreme precision or high torque usage. Seldom do you have so much selection in a line of standard production machinery . . . with all of the benefits of standardization PLUS many of the advantages of custom designs! The Intermittor operates at speeds far greater than those possible with other types of index tables. The special acceleration characteristics of the FERGUSON ROLLER GEAR DRIVE insure smooth starting and stopping with little shock and vibration, at speeds up to 500 indexes per minute.

Over 150 standard models . . . many in stock! Get complete information on load ratings and dimensions . . . write for your file copy of Catalog No. 301.

HIGH SPEED INDEXING • STANDARD TRANSFER MACHINES • AUTOMATIC TOOLING

FERGUSON MACHINE CORPORATION OF INDIANA

Roller Gear Division, Dept. H16 • P.O. Box 5841, St. Louis 21, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 23

Removes metal in ¼ the time

JOB: Cleaning machine tool castings, the Rotor B-35 Vertical Air Grinder paid for itself out of savings in this plant in 13.3 weeks. The former 3600 rpm electric grinder took 40 minutes to remove a pound of metal. **RESULT:** The 6000 rpm B-35 does it in 10 minutes—saving 75% in grinding time.

Your nearby Rotor Application Engineer will gladly demonstrate this or other new Rotor tools on *your* job. Ask for Bulletin 56. The ROTOR TOOL Company, Cleveland 32, Ohio.

ROTOR TOOLS
CLEVELAND, OHIO

Here's the RIGHT TOOL for YOUR job!

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
Rotor High-Cycle Electric Tools: Grinders • Polishers • Sanders

CIRCLE INFORM-A-GRAM KEY NO. 24

ALL THE **PRODUCTION** YOU'LL *EVER* WANT—

ALL THE **PRECISION** YOU'LL *EVER* NEED

2549

The Hamilton No. 00 Gear Hobbing Machine

Generates spur gears and pinions of plus-precision for assemblies which the world relies upon for accuracy. You will marvel at its *rigidity* and *stamina*, at its quiet efficiency and ease of operation. And you will want it for your own when you apprehend the import of its *important* feature No. 10 (independent selection of feed and indexing). Capacity — .050" to 2" O.D. of the gear blank. Free Bulletin No. 2549 provides full information.

Address: THE HAMILTON TOOL COMPANY
832 SOUTH NINTH STREET
HAMILTON, OHIO, U. S. A.

It's the

Hamilton

PRECISION SMALL-GEAR HOBBING MACHINE

THESE ARE REPRESENTATIVE USERS OF HAMILTON GEAR HOBBING EQUIPMENT

AiResearch Manufacturing Co. • *Duncan Electric Co.* • Bendix Aviation Corp. • *Victor Adding Machine Co.* • Lear, Co. • *Minneapolis-Honeywell Regulator Co.* • Geophysical Machine Works • *Hughes Aircraft Co.* • Westinghouse Electric Corp. • *Rockwell Meters, Inc.* • Borg Products Division • *Herschede Hall Clock Co.* • U. S. Navy Electronics Laboratory • *Redstone Arsenal* • Smallwood & Son Machine Co. • *Link Aviation, Inc.* • Bell Aircraft • *Schlumberger Well Surveying Corp.* • Douglas Aircraft • *General Mills* • Teletype Corp. • *Elgin National Watch Co.* • U. S. Naval Gun Factory • *Grimes Manufacturing Co.* • Texas Instruments, Inc. • *McDonnell Aircraft Co.* • American Machine & Metals • *Stromberg-Carlson Co.* • Hamilton Standard • *U. S. Gauge Co.*

CIRCLE INFORM-A-GRAM KEY NO. 25

UNBRAKO STRIPPER BOLTS NOW AVAILABLE WITH THE NYLOK* SELF-LOCKING DEVICE

UNBRAKO STRIPPER BOLTS with the Nylok self-locking device. Nylon pellet locks them with positive, dependable prevailing torque action. Bolts are reusable.

Self-locking UNBRAKO stripper bolts (shoulder screws) save time, money and headaches wherever they are used. They eliminate the costly, time-consuming checking of bolts to see that they are securely tightened. They protect precision tools and dies from damage caused by vibration-loosened bolts. They assure that your equipment will have longer service life, with reduced maintenance and downtime.

UNBRAKO stripper bolts are manufactured to the highest standards of precision. They are made of heat-treated alloy steel with continuous grain flow lines and have fully formed Class 3A threads finished close to the shoulder for maximum strength and holding power. Shoulders, held to fine tolerances, are concentric with heads and threads for uniformly accurate fit. The tough, resilient, *permanent* nylon locking pellet is integral with the threaded section.

All standard UNBRAKO socket screw products are available with or without the Nylok self-locking device. Authorized industrial distributors stock them. Write us for catalog and technical data on the complete line. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

*T.M. Reg. U.S. Pat. Off.. The Nylok Corporation

UNBRAKO SOCKET SCREW DIVISION

STANDARD PRESSED STEEL CO.

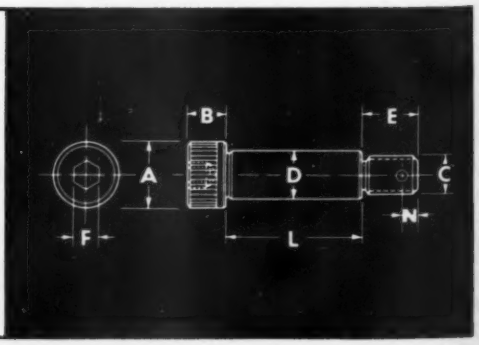
SPS

JENKINTOWN PENNSYLVANIA

SELF-LOCKING UNBRAKO STRIPPER BOLTS fasten this stripper plate securely. Constant vibration, shock, extended running time will not cause these bolts to loosen.

SPECIFICATION DRAWING. UNBRAKO stripper bolts are available with standard shoulder lengths ranging from ⅜ to 6 in.

D	Shoulder Diameter*	¼	5/16	⅜	½	⅝	¾
C	Thread Diameter UNC	10—24	¼—20	5/16—18	⅜—16	½—13	⅝—11
E	Thread Length	⅜	7/16	½	⅝	¾	⅞
A	Head Diameter	⅜	7/16	9/16	¾	⅞	1
B	Head Height	3/16	7/32	¼	5/16	⅜	½
F	Size of Hex. Hole	⅛	5/32	3/16	¼	5/16	⅜
N	Pellet Location	.141	.172	.187	.203	.234	.281
	*Shoulder Diameter Tolerances Max.	.249	.3115	.374	.499	.624	.749
	*Shoulder Diameter Tolerances Min.	.248	.3105	.373	.498	.623	.748



ROCKWELL-BUILT

DELTA 11" metalworking lathe

"You can't beat it for precision work"

say Sam and Charles Lentini, Co-Owners, Jacy Manufacturing Co., Brooklyn, N.Y.

ACCURACY TO 0.0003 INCH. The Lentinis use their Delta 11" Lathe to machine precision instrument parts and components for the aeronautical and electronics industries where extremely close tolerances are demanded. Their Delta meets these exacting demands down to plus-minus 0.0003-inch tolerance. Sam Lentini points out that the lathe's L-00 tapered key drive chuck insures a positive grip on the work.

SHIFTS OPERATIONS QUICKLY. With their Delta 11" lathe, the shift from turning or boring to threading or tapping is done with complete ease. There's no time lost in changing set-ups. "The big, legible dials on the Delta lathe make precision machining fast and easy," explains Charles Lentini.

CONSISTENT QUALITY. Jacy men get the same high quality results in metals ranging from brass to titanium—in lots as large as 30,000 or small as 10. As Sam Lentini points out, "For doing precision work in small lots or large, you can't beat the Delta 11" metalworking lathe."

PAYS ITS OWN WAY. "In a shop like ours with a variety of work, every tool must be versatile enough to pay its way on every job," says Charles Lentini, "and *we have yet to find a precision job that our 11" Delta couldn't do.*"

SEE THE ENTIRE DELTA 11" METAL LATHE LINE. **Compare—and make up your own mind. Your Dealer is listed under "Tools" in the Yellow Pages of your phone book.**

Send coupon for all the facts!

another product by **ROCKWELL**

Delta Power Tool Division, Rockwell Manufacturing Co.
622F N. Lexington Ave., Pittsburgh 8, Pennsylvania

☐ Please send Delta Industrial Catalog on entire Delta 11" Metal Lathe Line.

☐ Please send name of my nearest Delta Dealer.

Name_____ Title_____

Company_____

Address_____

City_____ County_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 27

OUT FOR 22 MINUTES—

Seeing a "Technical Metal Working Film you'll never forget"

You are invited to view, in your own plant at a time of your own choosing, a sound moving picture that well may cause you to reconsider the whole approach to your metal turning processes. And we predict that you will wish to have it re-run, perhaps several times, for selected management, production and engineering personnel.

For the new Monarch film "When The Chips Are Down" is *not* a sales or a product demonstration film. It is a factual study of the progress of our Machinability and Development Laboratories. It is a report of their scientific attack on such turning problems as feed, speed, and tooling expressed in the obtaining of data on cutting tool forces, tool geometry, work distortion, and vibration; on chemical and metallurgical properties of metal; on shear properties; on cutting fluids. And it shows the practical applications of such research in improved design of lathes and lathe components. Also it makes possible a service to our customers whereby we help them achieve optimum cutting conditions, top quality and accuracy, highest production returns.

Special instrumentation applied to Monarch Machinability Test Lathe.

If you will just write us (Dept. A) on your business letterhead, we will gladly make arrangements for a viewing—without the slightest obligation. You might well find it the most rewarding twenty-two minutes of a busy day.

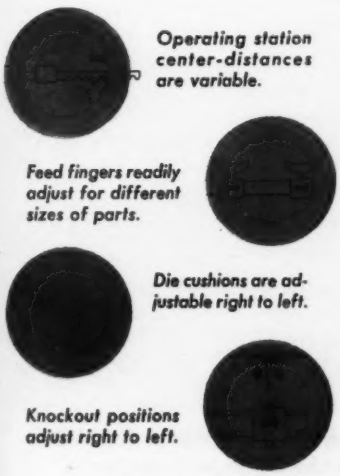
Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 28

Press automation for small parts at moderate cost?

Yes, with a Clearing Series-S Transflex Unit


Operating station center-distances are variable.
Feed fingers readily adjust for different sizes of parts.
Die cushions are adjustable right to left.
Knockout positions adjust right to left.

Transflex—transfer feeding plus the ability to produce a variety of parts—has now been applied to Clearing Series-S presses. These moderate priced straight side presses are produced in capacities from 75 through 300 tons.

These presses have all the major adjustment features typical of all Transflex units. In addition, provision is made for fast detachment of the finger bars so that die changes are quick and easy. Feed change-over—as required from part to part—is practically instantaneous.

As a result, it is now possible for manufacturers with requirements for a number of different medium size parts to automate production even when runs are not long. These presses bridge the gap between progressive die production and the conventionally large transfer presses. It is possible to have as many as sixteen die stations on a single press of this type.

A press like the one above can provide your plant with press automation *plus flexibility* of production at a cost that heretofore would have been considered impossible. We have a great deal of information on Transflex available. It's yours for the asking.

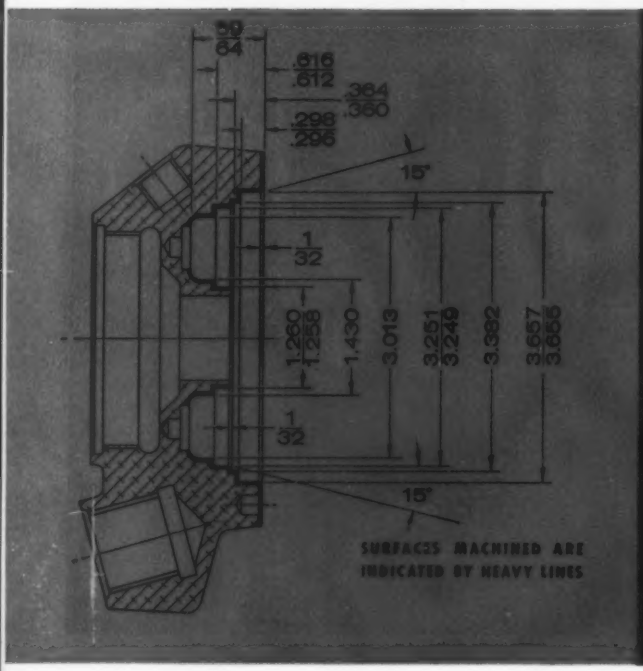
CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION *division of* **U. S. INDUSTRIES, INC.**

6499 W. 65th STREET • CHICAGO 38, ILLINOIS • HAMILTON PLANT • HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 29

13 surfaces finish machined in 2 passes...



HERE'S HOW MICROBORE CLUSTER TOOLING DOES IT ON A TURRET LATHE!

This Special Microbore Production Tooling was designed for a well known hydraulic pump manufacturer to machine pump covers on a turret lathe. Operations include precision boring and turning thirteen diameters and faces in only two passes. Think of the costly manhours saved and down time eliminated in comparison with conventional, piecemeal methods of handling this same job.

ACCURACY IS AN ECONOMY—With the Microbore System of cluster tooling, independent precision adjustment of each Microbore tool point permits accurate settings in a matter of seconds. On piece after piece, machined surfaces are held to extremely fine limits.

Microbore is a versatile tool that can be applied singly or in clusters for all types of boring, turning and facing operations. Microbore also manufactures Standard Boring Bars, Boring Bar Sets and Microbore Flash-Change Tooling—the ultimate for quick change tooling.

Join the leaders who are already multiplying their profits with modern Microbore tooling and methods. Write for Catalog No. 56.

DeVlieg Microbore System

DE VLIEG MICROBORE • DIVISION OF DE VLIEG MACHINE COMPANY

2720 West Fourteen Mile Rd., Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 30

VERSATILITY AND PRECISION TEAMED FOR PROFIT...

COVEL No. 32
UNIVERSAL AND TOOL GRINDER

As a man responsible for the profitable operation of your department or plant, you recognize the value of a machine which teams versatility with precision—does several different jobs, and does them well. Such a machine is the Covel No. 32!

On your internal, external and circular form grinding—on your tool sharpening operations—No. 32 reduces costs, increases your profit margin.

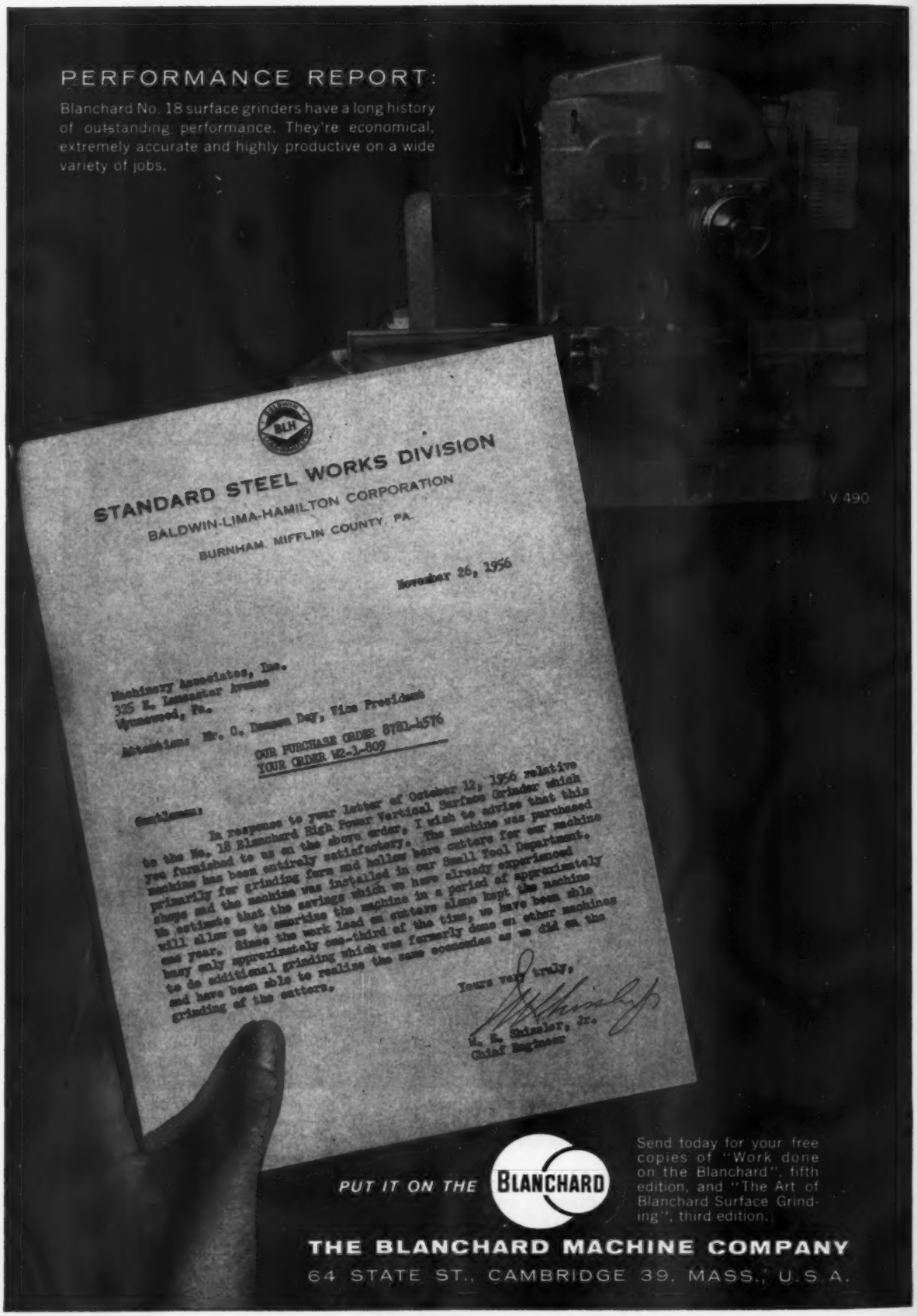
For convincing facts on this new 12 x 30 universal and tool grinder, with infinitely variable table and headstock speed control, mail the handy coupon right now!

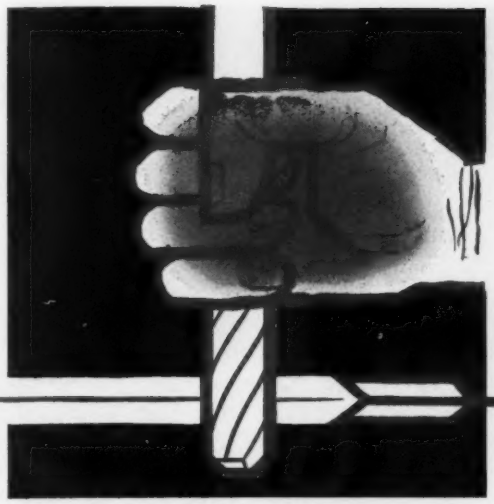
COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN
Dept. TP-67

HYDRAULIC & HAND FEED
SURFACE GRINDERS • UNIVERSAL
CUTTER & TOOL GRINDERS • DRILL GRINDERS

☐ Send full details on the No. 32.
☐ Have your representative call.

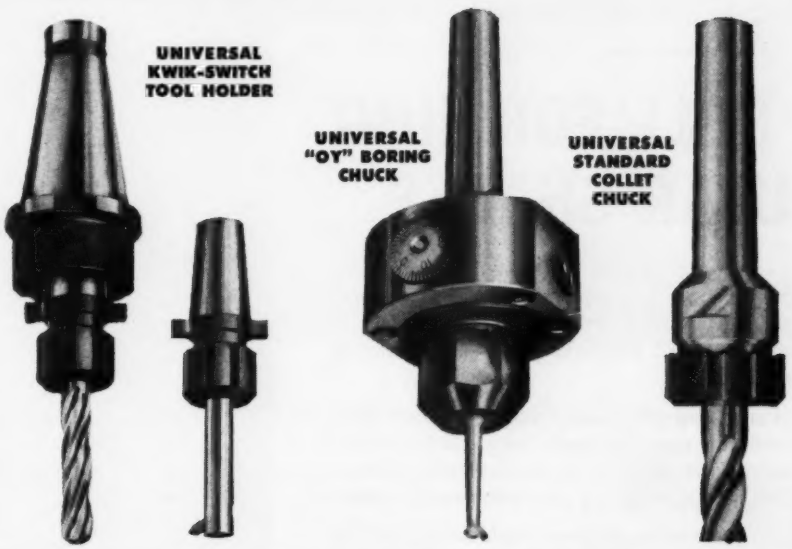
Name_____ Title_____
Company_____
Street_____
City_____ State_____


PERFORMANCE REPORT:
Blanchard No. 18 surface grinders have a long history of outstanding performance. They're economical, extremely accurate and highly productive on a wide variety of jobs.
V 490
STANDARD STEEL WORKS DIVISION
BALDWIN-LIMA-HAMILTON CORPORATION
BURNHAM, MIFFLIN COUNTY, PA.
November 26, 1956
Machinery Associates, Inc.
325 E. Lancaster Avenue
Wynnewood, Pa.
Attention: Mr. C. Dawson Day, Vice President
OUR PURCHASE ORDER 8781-4576
YOUR ORDER M2-1-809
Gentlemen:
In response to your letter of October 12, 1956 relative to the No. 18 Blanchard High Power Vertical Surface Grinder which you furnished to us on the above order, I wish to advise that this machine has been entirely satisfactory. The machine was purchased primarily for grinding form and hollow bore cutters for our machine shops and the machine was installed in our Small Tool Department. We estimate that the savings which we have already experienced will allow us to amortize the machine in a period of approximately one year. Since the work load on cutters alone kept the machine busy only approximately one-third of the time, we have been able to do additional grinding which was formerly done on other machines and have been able to realize the same economies as we did on the grinding of the cutters.
Yours very truly,
H. E. Shissler, Jr.
Chief Engineer
PUT IT ON THE BLANCHARD
Send today for your free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding", third edition.
THE BLANCHARD MACHINE COMPANY
64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



positive
grip
and true-running
tools

ARE CERTAIN WITH UNIVERSAL CHUCKS SUCH AS THESE:



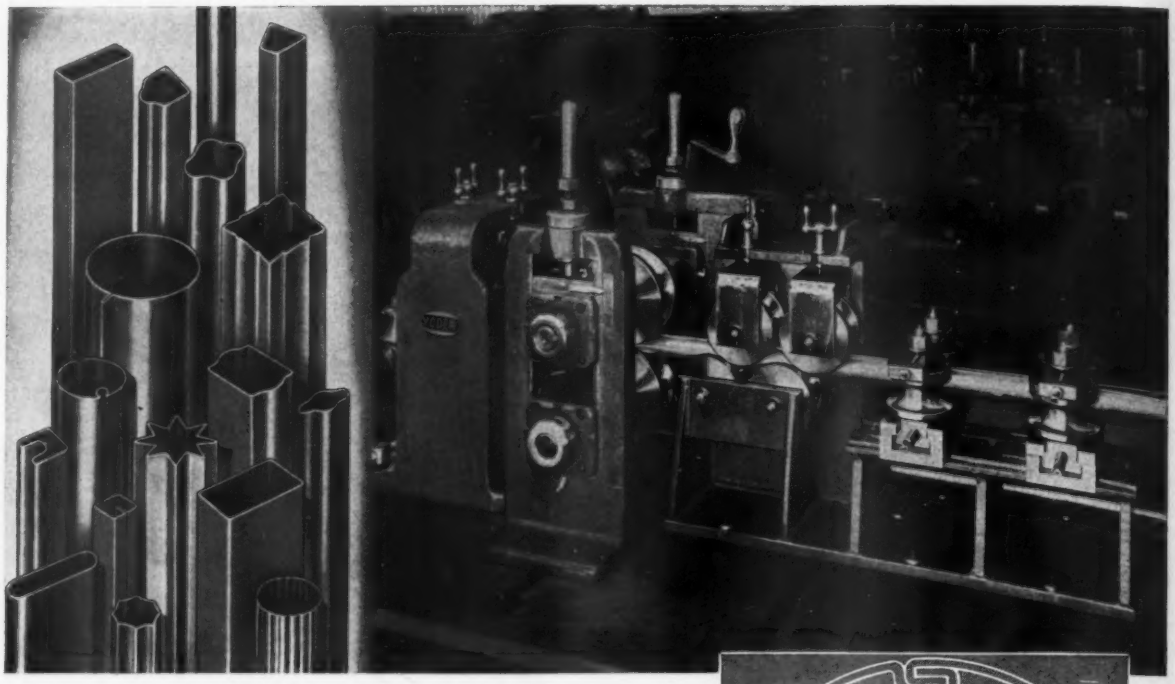
A sure, solid grip on tools is provided by the wrap-around action of Universal chucks because the slotted collet grips the tool on a continuous surface the full length of the collet. This positive grip, plus the precision manufacturing of all Universal chucks, keeps tools running true to .001" within an inch from the nose of the chuck. Our simplified chuck design eliminates auxiliary bearings, resulting in low cost to you. Sizes range from 1/16" to 1 1/2", with shanks to fit any machine. For complete information on these three or other Universal chucks, write the office nearest you: Universal Engineering Sales Co., 1060 Broad St., Newark, N. J., 5053 Sixth Ave., Kenosha, Wis., or our home office in Frankenmuth.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 8, MICHIGAN

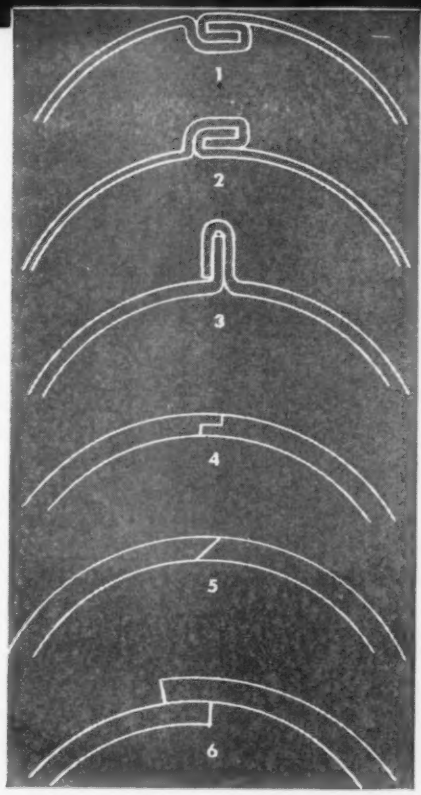
195

CIRCLE INFORM-A-GRAM KEY NO. 33



Lock-Seaming attachment at exit end of forming machine.

COLD ROLL FORMING TUBULAR SHAPES



Among the wide variety of things you can make on a Yoder Cold Roll Forming machine are round, square, oval, rectangular and other tubular shapes, such as illustrated at left above. The seams may be open, lapped, butted, dovetailed, interlocking, etc.—as indicated in Figures 1 to 6 at the right.

Millions of feet of such unwelded tubular shapes are made from coiled strip for conductor pipe, bedsteads, lamp stands, window channel, wiring raceways, carrying rods, etc. Production ranges from 20,000 to 50,000 feet per day, with only one operator and a helper.

Yoder offers you the cooperation of their engineering staff for designing and adapting their cold roll forming machines, auxiliaries, and tooling, for the low cost production of structurals, mouldings and trim, panels, tubular and other shapes, to meet individual needs.

The Yoder book on Cold Roll Forming is a complete, illustrated text on the art and the equipment needed for performing a variety of operations which can be combined with cold roll forming, at little or no extra labor cost. A copy is yours for the asking.

THE YODER COMPANY
5501 Walworth Avenue **Cleveland 2, Ohio**

ENGINEERING
YODER
MANUFACTURING

COLD ROLL FORMING MACHINES
PIPE AND TUBE MILLS (ferrous or non-ferrous)
ROTARY SLITTING LINES

CIRCLE INFORM-A-GRAM KEY NO. 34

Fully Automatic Finger-Tip Controls

Reid-O-Matic Model 824 . . . the most versatile surface grinder in today's metalworking field, is completely electric . . . fully automatic. A control panel, at finger-tip level provides complete power control of all grinder adjustments.

Reid-O-Matic operators can "set-up" faster . . . change settings quicker . . . produce close tolerance grinding in the toolroom without unnecessary labor. For your surface grinding specialists, the new Reid-O-Matic is a "Production Giant."

SPECIFICATIONS

Capacity: 8" wide, 24" long, 21" high from table to center of spindle. Standard wheel 12" x 3" x ¾" included.
Table Speed: Infinitely variable from 0 to 90 F. P. M.
Cross Feed: Infinitely variable from .001 to .250.
Floor Space: 93" x 51½" x 71¾" high.
Weight: 4,000 lbs., Net.

For Production and Toolroom Grinding . . .

REID BROTHERS COMPANY, Inc.

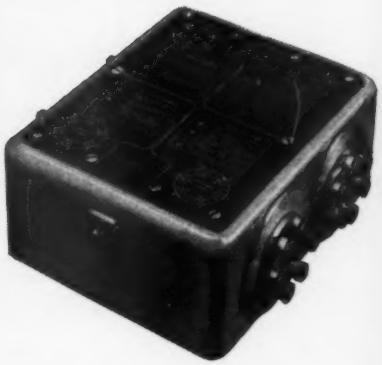
133 Elliott Street, Beverly, Massachusetts

Write for Bulletin 824

MANUFACTURERS OF PRECISION SURFACE GRINDERS AND PRODUCTION LATHES

CIRCLE INFORM-A-GRAM KEY NO. 35

By simply presetting this Electro-Cycle Drum Control, spindle speed, starts and stops, spindle direction and reverses for each turret face are automatically controlled. Your operator can quickly handle large volumes of precision work, without tiring himself on time-consuming manual operations.



Warner & Swasey Electro-Cycle® Turret Lathe boosts production 30% at Decatur Pump Co.

Automatic lathe operation, provided by the Electro-Cycle principle, substantially reduced both handling time and operator fatigue. Immediately, production increased and profits improved.

This nationally-known producer of "Burks" Super Turbine and Centrifugal pumps, located in Decatur, Illinois, recently replaced a conventional geared head turret lathe with a new Warner & Swasey No. 3 Electro-Cycle. Immediately, their production of pump jet bodies—machined from bronze castings—increased 30%.

Using his new Electro-Cycle, the operator easily produced more finished parts per shift because:

- **Workpiece handling was cut to a minimum.**
- **Fatigue was substantially reduced.**
- **Automatic operation eliminated all time-consuming hand work.**

On both ferrous and non-ferrous materials, Electro-Cycles are daily turning in equally impressive records in machine shops all over the nation. Why not ask our Field Representative to show how they can help increase your production—and profits, too.

® Reg. U. S. Pat. Off.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

CIRCLE INFORM-A-GRAM KEY NO. 36

Brown & Sharpe brings you 12 new fine-quality micrometers

...AT NEW LOWER PRICES

Twelve new Brown & Sharpe micrometer calipers, utilizing hardened steel spindle faces, offer worthwhile savings in price for economy-minded mechanics. These mikes bring you at low cost the many famous Brown & Sharpe features that make precision measuring easier and surer. Choose them for reliable accuracy... you'll be making a wise investment!

FEATURES OF ADVANCED DESIGN

1. Large-diameter thimble is easy to read — Clean-cut black graduations and numbers are widely spaced for fast reading, on a rust-resistant, dull chrome finish.

2. One-piece spindle and screw assure accuracy — Threads are carefully hardened and accurately ground to protect against loss of reading accuracy and excessive wear.

3. Adjustment is simple — Smooth, sliding taper adjustment for thread wear maintains accuracy, month after month. Thimble is adjustable for positioning thimble graduations accurately...can be adjusted longitudinally on screw.

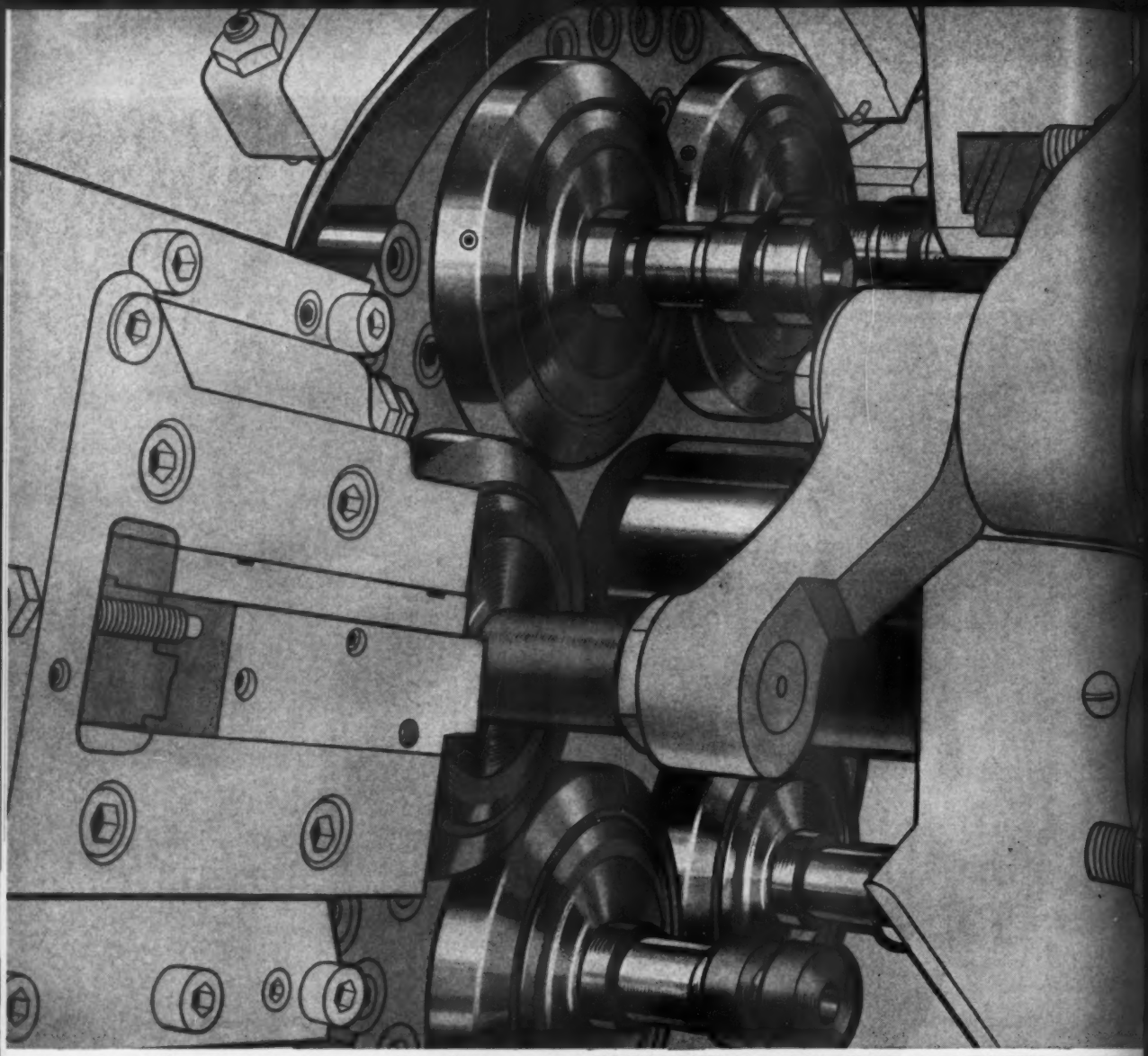
AVAILABLE IN 0"-1", 1"-2", and 2"-3" SIZES
with and without clamp rings and ratchet stops

WRITE FOR FULL DETAILS on this high-quality, lower-cost line. Brown & Sharpe Mfg. Co., Providence, R.I.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

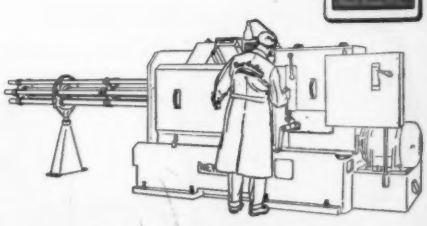
Brown & Sharpe B·S

CIRCLE INFORM-A-GRAM KEY NO. 37

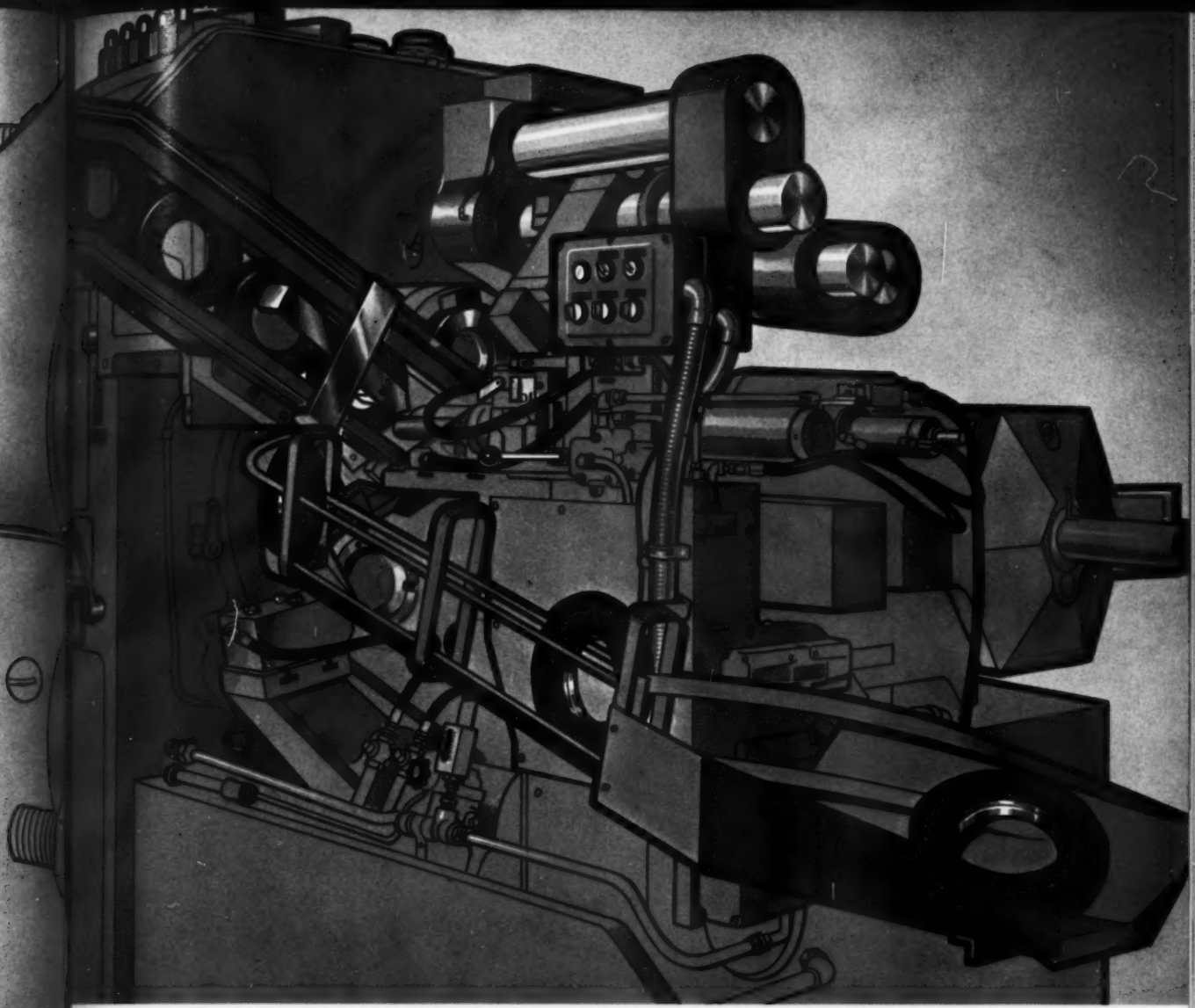


get more bar work done with the widest range of spindle speeds

The New Britain Model 62, 2¼" automatic bar machine illustrated, has a spindle speed range of 117-3,000 R.P.M. No other multiple spindle bar machine in its capacity offers as wide a range of spindle speeds combined with New Britain standards of accuracy. Before you decide on *any* bar machine, be sure to check on *new* developments in New Britains. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



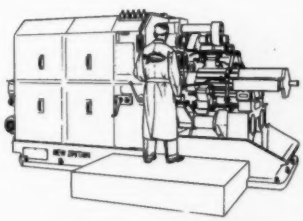
Automatic Bar Machine



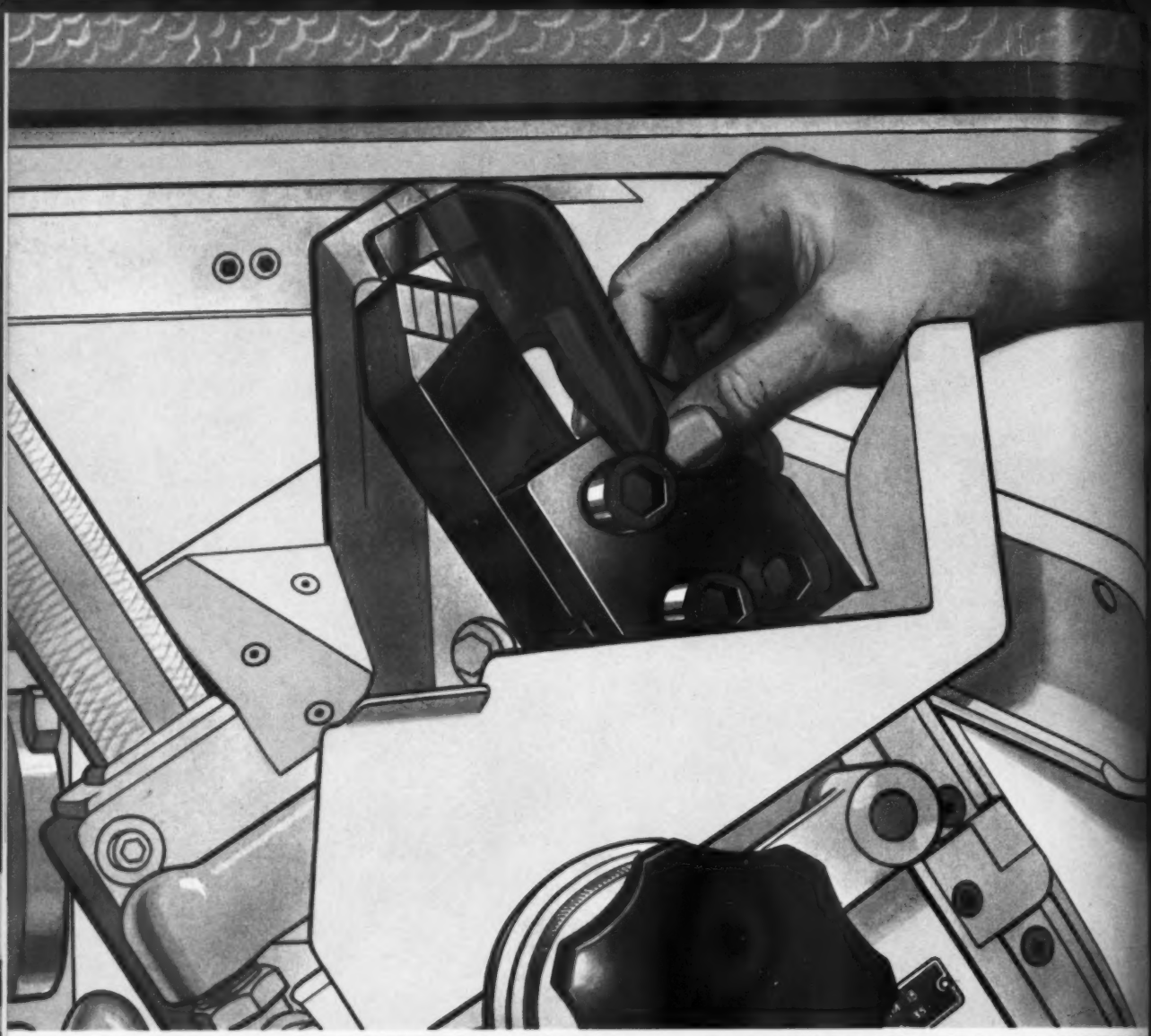
get more chucker work done

with automatic "handling"

New Britain chuckers are the time-tested leaders in their field. Their basic open-end design, an exclusive New Britain feature, makes them unusually well adapted to the automatic handling of pieces. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



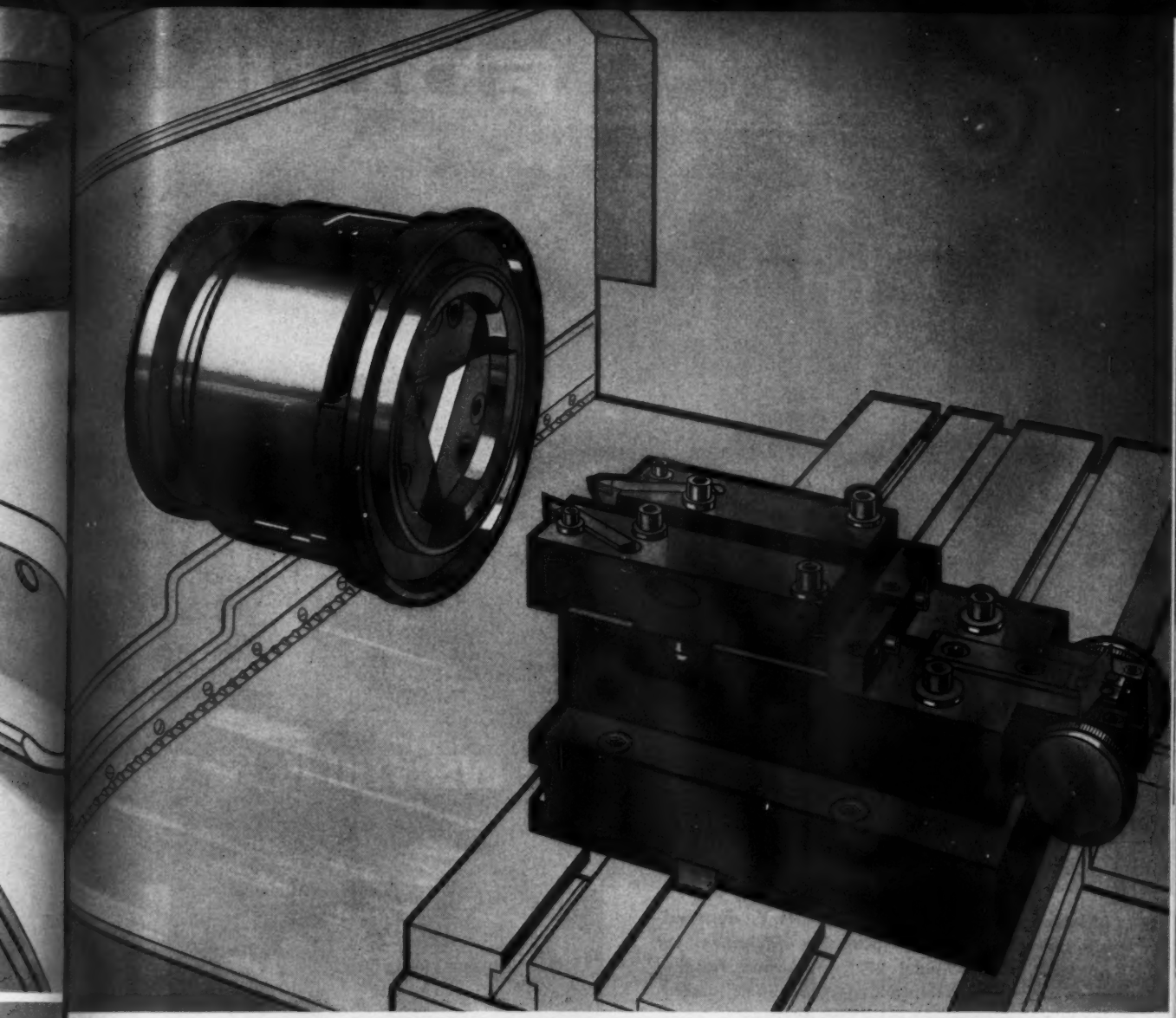
Automatic Chucking Machine



1-minute tool change gets more contour work done

It's a fact — you can do more work in a day with a New Britain +GF+ copying lathe and a single-point tool, than with a conventional lathe using half a dozen. Just slip out the worn tool, slip in a new one, gauge it to a single dimension and you're ready to go again. The template repeats the dimensions. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

New Britain +GF+ Copying Lathe



closer tolerances because of cam control

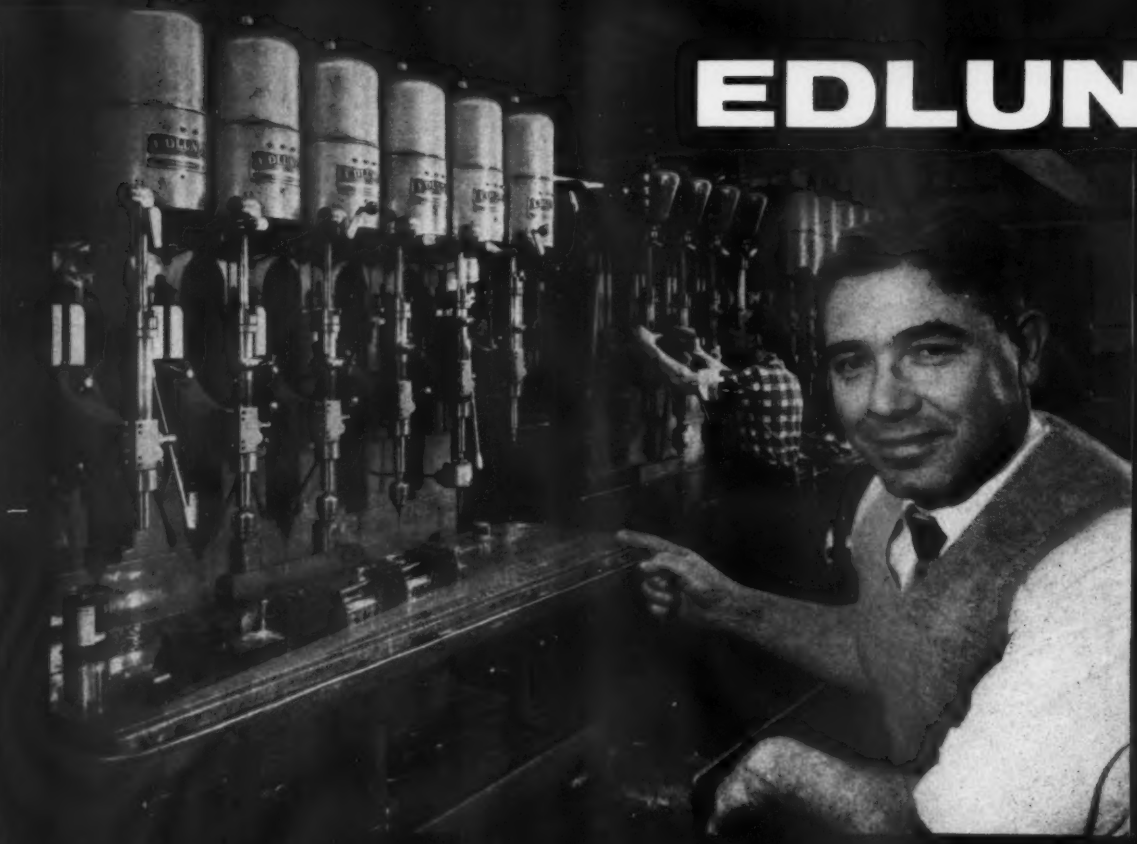
in New Britain precision boring machines

Every piece turned out by a New Britain Precision Boring Machine is accurate in every dimension because of the precision cams which control the slides. Tool wear can be checked by gauging a single dimension per tool of even the most complex contoured piece. There's no substitute for this positive uncomplicated dimensional control when you're working to "tenths." The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

Precision Boring Machine

CIRCLE INFORM-A-GRAM KEY NO. 41

EDLUND



"EDLUND DRILLING MACHINES DO EVERYTHING WE WANT *With Maximum Dependability*"

At Intertype Corporation, Brooklyn, N. Y., outstanding manufacturers of typesetting equipment for printers, Edlund Model 2F Drilling and Tapping Machines received the following comments, according to an independent reporting agency:

"Down time due to maintenance has been eliminated with big savings in replacement costs"

"We have proved to our own satisfaction that the Edlund Drilling Machines require the least amount of maintenance"

"Constant delivery of horse-power for high precision work on toughest castings and machined parts"

"Greater flexibility of the Edlund Model 2F reduces trial and error in setting machine speeds because we can get correct in-between speeds"

"7 additional Edlund 2F Machines were ordered last year and 6 more are on order now — these plus the 48 spindles already in operation best show our satisfaction"

Edlund Model 2F used for precision drilling operations at Intertype Corporation

EDLUND Representatives in Major Cities

For complete information and specifications about the Edlund Model 2F for your jobs write for Bulletin 140R.

EDLUND
MACHINERY COMPANY
Cortland, New York
Division of Harsco Corporation

DROOBLES

by ROGER PRICE

Bench Model BC-7C

Floor Model FC-30

Floor Model FC-14

"LEFT-HANDED MONKEY WENCH"

Her name was Yvonne, and I won her in a crap game in Greenwich Village. She was a winsome little thing, and at first we got along famously. She was a good housekeeper, and her cooking wasn't half bad, if you like a steady diet of banana fritters, banana bread and banana pudding. Some people would call Yvonne talented, I suppose, but frankly, she had lots of faults, too, like singing off-key, and lacing my beef stew with absinthe. Finally, when she started nagging me and sneering at my sparkling witticisms, I got fed up and gave her to my worst enemy. Now they're both on TV, making a fortune, and I'm back doing my own typing again.

Without monkeying around any further, I'd like to give you a few facts on Jones & Lamson Optical Comparators. These precision-built instruments are on the job throughout industry, keeping quality control high by rapidly and accurately measuring and inspecting all sorts of parts and objects. The J & L Comparator's speed, accuracy (to .0001") and ease of operation make it equally valuable for both production line and small-lot work. Investigate how the J & L Comparator can help keep production quality high, and scrap low, in *your* plant. Available in eleven bench and floor models. For complete information, write Dept. 710 *today*.

JONES & LAMSON OPTICAL COMPARATORS *On the Job . . .*

at New Milford Carbide Tool Co., Hackensack, N.J.

J & L Comparators speedily and accurately check angles, radii, contours and linear dimensions of precision carbide and H.S.S. form tools, thereby assuring conformance with specific customer requirements.

at American Coldset Co., Paterson, N. J.

The rapid, precise inspection of special and standard industrial diamonds, by means of J & L Optical Comparators, safeguards the maintenance of high quality standards.

"The originator of machine tool standards in optical inspection"

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 513 Clinton Street, Springfield, Vt., U. S. A.

Please send me Comparator Catalog 402-C, which describes the complete line of J&L Optical Comparators.

name _____ title _____ street _____

company _____ city _____ zone _____ state _____

CIRCLE INFORM-A-GRAM KEY NO. 43

ELLSTROM CHROMIUM PLATED GAGE BLOCKS are guaranteed "minus nothing" from nominal size!

Here at last are gage blocks with a positive "built-in" wear factor! The only blocks ever produced and priced as standard with dimensional accuracy unconditionally guaranteed to be within specified millionths on the "plus" side of nominal block size and minus "zero" . . . absolutely nothing . . . undersize!

This complete elimination of the conventional minus tolerance gives you, the gage block user, three new and exclusive benefits. First, it provides positive assurance against receiving new blocks that are actually "worn" undersize during manufacture before they are ever used. Second, it gives you finer, more practical accuracy . . . with the sure knowledge that every Ellstrom block you buy will start wearing *toward* its nominal size rather than away from it. And third, it gives you a guaranteed minimum wear factor equivalent in millionths to the full minus tolerance specified as standard for all other makes of blocks!

Write for descriptive literature containing complete price information today!

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE COMPANY

"Measuring in Millionths for Three Generations"

22038 Beech Street • Dearborn, Michigan

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE UNITED STATES AND CANADA

Ellstrom Gage Block Accuracy Guarantee

"W"—WORKING ACCURACY BLOCKS
Measured Length: +.000008"/−.000000"
Parallelism: .000004" Flatness: .000004"

"I"—INSPECTION ACCURACY BLOCKS
Measured Length: +.000004"/−.000000"
Parallelism: .000003" Flatness: .000003"

"L"—LABORATORY ACCURACY BLOCKS
Measured Length: +.000002"/−.000000"
Parallelism: .000001" Flatness: 000001"

Ellstrom—your best buy in gage blocks for shop and tool room use, inspection and laboratory applications. Available in 28 standard sets ranging from 8 to 92 blocks in both square and rectangular styles with or without basic gage block accessories.

CIRCLE INFORM-A-GRAM KEY NO. 44

. . . Month's Talk from Front Cover

builders to develop new models. Conversely new customer requirements, which make it necessary for machine tools to do things they never did before, make it necessary for us constantly to present to you our new problems for your solution. Working together, we are shoving obsolete machines down the road to oblivion faster than was ever done before.

Now, all of us here today are engaged, directly or indirectly, in the building and selling of productive equipment. And I emphasize the word "selling."

Today many types of equipment have become so highly technical that it takes engineers to explain them and to sell them. Hence the development of the man we call the sales engineer.

And yet, for some reason, in some cases the engineering mind does not seem to turn naturally in the direction of sales. I've been trying to figure out why. I think perhaps the answer is that today sales involve financial problems and considerations that are outside of and beyond normal engineering experience.

A survey I saw not long ago showed that the type of men who are becoming top executives of corporations these days are financial-minded men — men who are cost-conscious and profit-conscious; mostly profit-conscious. The decision of such an executive with respect to the purchase of capital equipment will be guided by his company's cash position and the effect of the purchase upon future profits.

Is the engineer profit-conscious? Does he understand a balance sheet? Does he understand the impact of taxes? Does he know the various financial factors which enter into the purchase of capital equipment?

Without such understanding, can an engineer be properly sales-minded today? I don't think so. And I'm afraid a good many engineers get so wrapped up in designing something that works, that they forget to consider whether or not it will work at a profit.

What makes it so important for engineers to become financial minded is that the decisions to buy capital equipment often rest with financial men who do not understand engineering. Therefore, they have to be approached on the financial side, or, let us say, the non-technical side.

This brings me back to the subject of obsolescence. This is a word with which we are all familiar. Everyone of us thinks he knows what it means. But as a matter of fact, it has *two* meanings.

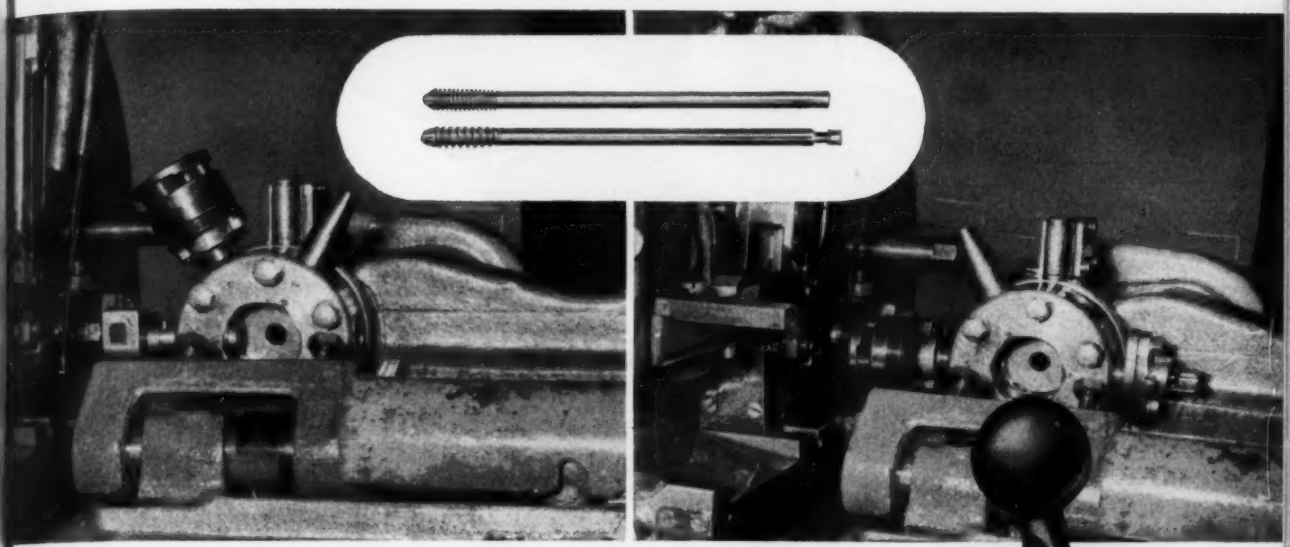
One meaning, says the Century Dictionary, is "worn out." The second meaning is "gone out of use."

. . . *Continued on Page 47*

An address presented before The 21st Annual Westinghouse Machine Tool Electrification Forum.

Westinghouse adds new productive capacity to present metal turning equipment

and eliminates costly secondary machining operation



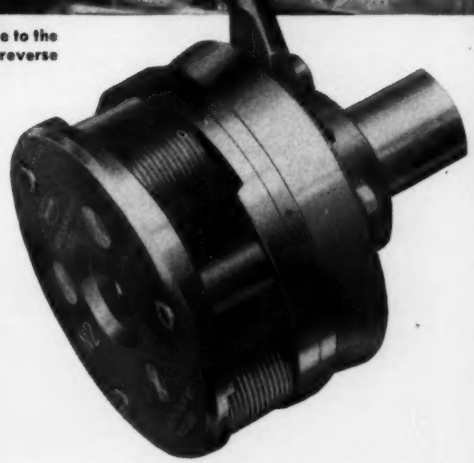
In this setup, on a Brown & Sharpe automatic, down time was reduced to a minimum, due to the fact that it was possible to thread more than 500,000 pieces before it was necessary to reverse the rolls—a distinctive Acme-Fette feature which doubles the life of threading rolls.

ROLLS THREADS . . . faster and better

WITH NEW ROTATING — NON-ROTATING

Acme-FETTE

THREAD ROLLING HEAD AND ROLLS



With an Acme-Fette THREAD ROLLING HEAD in the primary setup, Westinghouse completed these electric appliance terminals without a secondary machining operation. Time saved in rehandling alone more than equalled the cost of the head and rolls.

Acme-Fette Thread Rolling Heads are available in 8 sizes, in capacities from $\frac{1}{16}$" to 2", at only a fraction of the cost of specialized equipment. The same head can be used in both rotating and non-rotating spindle machines—either horizontal or vertical.

For cost-reducing ideas showing how you can combine thread rolling operations on your present equipment, send for Catalog NAF-57.

- **Makes threading from the end now possible on any rotating or non-rotating spindles.**
- **Rolls threads up to 5 times faster than—and without chip problems associated with—thread cutting.**
- **Provides smoother threads, of consistently closer tolerance, with greater tensile strength—and without cratering at the thread crest.**

National Acme

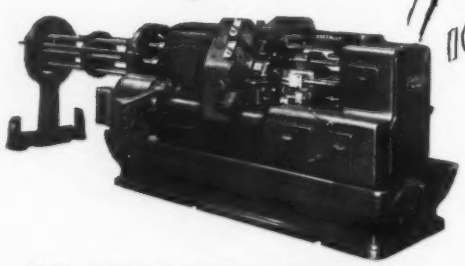
THE NATIONAL ACME COMPANY, 169 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 45

Dependable...

PRODUCTION MACHINERY
GREENLEE

Automatic Bar Machines



SIX AND FOUR-SPINDLE AUTOMATIC BAR MACHINES

GREENLEE Special Machine Tools

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Hydro-Borer Precision Boring Machines

BOOST PRODUCTION REDUCE DOWN TIME

It's easy to maintain rigid production schedules . . . prevent costly bottlenecks with Greenlee Bar Automatics. They are always on the job . . . give continuous, reliable service.

You hear much comment about Greenlees' uninterrupted, round-the-clock performance in widely different industries. With good reason, too, for Greenlee offers years of manufacturing experience... plus manufacturing integrity not often duplicated.

Want complete information? Call in the Greenlee man. Let him give you the complete story. Please submit a print when inquiring about a specific job.

WRITE FOR CATALOG No. A-405

GREENLEE BROS. & CO.

2046 MASON AVENUE
ROCKFORD, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 46

. . . Month's Talk from Page 44

In the old days these two meanings amounted to about the same thing, because a piece of equipment did not go out of use until it was worn out.

But that certainly is not the case today. Nowadays a great deal of equipment goes out of use, or certainly *should* go out of use, long before it is actually worn out, because a new type of equipment has been devised which will do the job faster and better, and at lower cost. Today, therefore, "obsolete" means outmoded or superseded.

One of our big difficulties, however, is that some financial executives still have the old concept of obsolescence as meaning the physical wearing out of a machine. This represents, in my opinion, our most important single area of resistance.

How can we persuade the nontechnical man, the financial man, the conservative who often has a deciding voice in policies regarding capital investments, that today obsolescence is literally galloping, and that replacement of equipment still in good working order, but actually obsolete, is imperative on behalf of survival?

Perhaps the thing to do is to keep pounding away on the broad theme that the world is moving much faster than it ever moved before, and unless you keep up with it you are going to be caught hopelessly behind.

In his January 1957 Economic Report to the Congress, President Eisenhower made this statement:

> "Since 1952 business firms and farmers have spent over 150 billion dollars to increase capacity and replace worn out or obsolete facilities."

Let's make an interesting comparison. Back in 1942 the nation's total gross national product was only 159 billion. In short, expenditures on capital improvements *alone*, over the last four years, were about equal to what was the value of the country's *total goods and services* only fifteen years ago.

Why this great expenditure? The answer lies in facts such as the following:

In 1954 the National Science Foundation made a survey which disclosed that at that time about 30% of the scientists and engineers employed by the industries surveyed were engaged in research and development.

Using this survey as a basis, and bringing facts up to date from other sources, President Eisenhower, in his Economic Report to the Congress, estimated that, including research done by the government, the total annual national expenditure for research and development now ranges from 6 billion to 9 billion dollars. This will give you some idea of how fast obsolescence is galloping today.

There are various things in the offing that may affect all of us before

. . . *Continued on Page 48*

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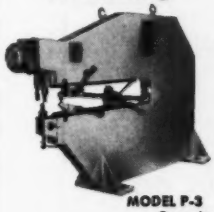
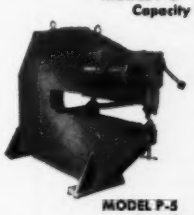
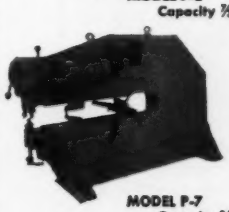


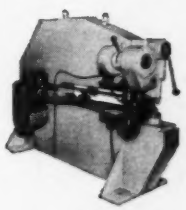
MODEL P-3
Capacity ½"



MODEL P-5
Capacity ⅝"

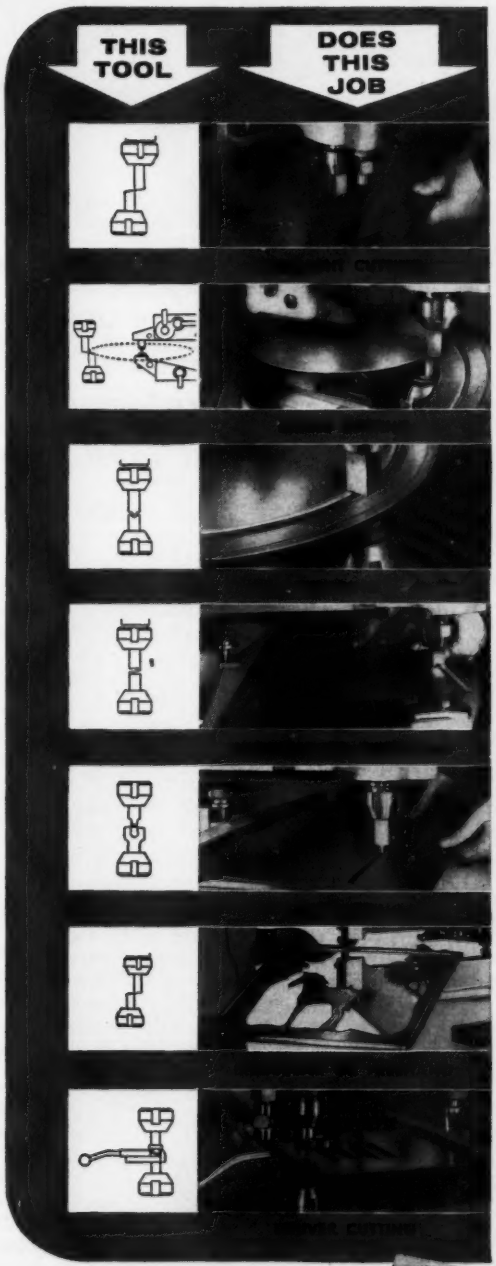


MODEL P-7
Capacity ⅝"



MODEL P-9
Capacity 1¼"

TRIMMER-3
Capacity ½"



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CIRCLE INFORM-A-GRAM KEY NO. 47

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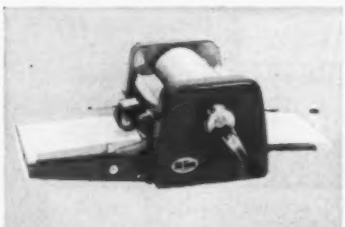
Special Production Report:

on how manufacturers might make a product at substantially lower overall costs.

How much does it cost you to manufacture your product in your own plant? Manufacturers these days are taking an awfully close look. Idle machines of almost any kind cost a great deal to own in the present era of high prices. The productivity of these machines can't be curtailed without serious production cost increases.

This is the reason many manufacturers are having assemblies and even complete products made for them on the outside. It seems to cause them less trouble and, when completely analyzed, often costs *less* per unit built. Specialists in contract manufacturing very seldom have to eat up idle press time. They work on many different jobs, using their equipment in the most efficient way possible.

A fabricator like Laystrom Manufacturing Co. will have a large, well equipped press room that incorporates equipment suited to many different kinds of work. For this reason it very likely is possible for them to handle a job with the same type of equipment the manufacturer himself would use. And, having many other customers, such a fabricator will keep that equipment in operation day and night, thereby operating at lower costs.



Outside manufacturing help can include even complete production of highly complex mechanical devices.

Summing up: Any manufacturer can positively, accurately foretell his costs by having his products made on the outside. And frequently these costs are less, along with fewer production troubles. *We'll send you our brochure and will be happy to discuss your particular situation. Confidentially, of course . . . Write: Laystrom Manufacturing Co., 2005 N. Parkside, Chicago 39.*

CIRCLE INFORM-A-GRAM KEY NO. 48

. . . Month's Talk from Page 47

we are hardly aware of it — making it necessary to develop entirely new approaches to techniques which we assume are established.

What about the use of atomic energy for industrial purposes? The United States already has two seagoing atomic submarines. Will we be using nuclear power to machine metal?

About a year and a half ago, out in Arizona, over 1000 scientists, engineers, educators and industrialists from all over the world met to discuss ways and means of harnessing the energy of the sun. One of the main topics was that of operating machines by solar power.

How fast are these things going to happen, if they do? That, of course, we don't know. But we do know that the pace of research and development is constantly accelerating at an incredible rate.

There are basic forces that are pushing our whole economy in this direction.

One of these basic forces is, of course, competition, with its perpetual emphasis upon cost reduction in the face of mounting wages and taxes. But there is another basic force which is pushing us — and that is the continuing demand, by the American people, of a steady increase in the standard of living.

They all want more and better things. If this demand continues at the same pace it has in the past, an accelerated rate of technological advancement will be necessary in order to enable the available labor force in this country to supply the amazing volume of goods and services that will be required.

An interesting study of this subject has recently been made for the American Enterprise Association by Dr. Almarin Phillips, Associate Professor at the Graduate School of Business Administration, University of Virginia.

Studying the possible impact of automation, Dr. Phillips came up with these estimates:

By 1975 the population of the United States will probably have risen from 165,000,000, which it was in 1955, to something over 200,000,000.

The total labor force was 69,000,000 in 1955, and probably will be about 89,000,000 in 1975.

A little over 62,000,000, or 93% of the labor force, were engaged in production in 1955. Dr. Phillips estimates that 94% of the labor force, or about 84,000,000, will be engaged in production in 1975.

Meanwhile, according to Dr. Phillips' projections, gross national product will have risen from 391 billion dollars in 1955 to 711 billion in 1975.

This will be an increase of 82% in gross national product. But there

. . . Continued on Page 51

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CIRCLE INFORM-A-GRAM KEY NO. 50

. . . Month's Talk from Page 48

will only be an increase of 35.5% in the labor force available to turn out this enormous increase in production. This means that productivity per man must be very substantially stepped up — and that can't be done on the equipment of yesterday.

In the light of the various factors which I have summarized, I am convinced that the buying of productive equipment will continue at a high level. There may be periodic dips, but the long-term trend will be upward. In the immediate future there may not be so much buying for expansion, but there *must* be increased buying for replacement. The pace of research and development, the push for higher standards of living, and the need for increased productivity per man per hour, combine to make this inevitable.

Our problem right now is that of convincing the financial man and the conservative-minded executive that a piece of equipment becomes obsolete the moment it is out-moded by something better, and that obsolescence isn't a matter of age.

We can talk to the financial man on the basis of the broad findings of the National Science Foundation, and studies like those made by Professor Phillips, because these are non-technical approaches to the subject. But then we can go further.

Revisions in the Internal Revenue Act of 1954 permit the writing off of the cost of new equipment much more rapidly than was formerly the case. This is an important consideration. Under the law as it now stands, the purchaser of equipment has two options.

The first is the double declining balance method, under which a company can write off about two-thirds of the original cost in the first half of a machine's tax life.

The second is the sum-of-the-digits method, under which a company can write off about three-fourths of the original cost in the first half of a machine's tax life.

The law as originally written was based on the old concept of depreciation; namely, that a piece of equipment did not go out of use until it was worn out. In fact, the Internal Revenue Department developed a schedule of what it called the useful life of various types of equipment. This was known as Bulletin F.

This was a great convenience to accountants. So it became common practice to write off a piece of equipment over the period prescribed by Bulletin F, regardless of how soon that equipment might in fact have been obsoleted by a newer model.

But at the time the law was revised in 1954, the Internal Revenue Department realized the falseness of this premise. They began to differentiate between the "useful" life of

. . . *Continud on Page 52*

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CASE HISTORY

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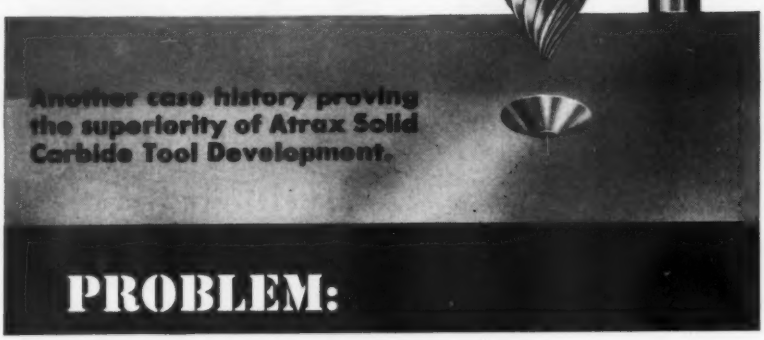

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CIRCLE INFORM-A-GRAM KEY NO. 52

. . . Month's Talk from Page 51

a piece of equipment, which was the period over which it could conceivably be operated, and the useful *profitable* life, which was the period over which it could conceivably be operated at a *profit*.

The result was the inclusion in the law of the two options for accelerated depreciation, which I described to you a moment ago, and in addition the allowance by the Department, in many cases, of shorter total write-off periods. In fact, the Internal Revenue Department has recently issued Revenue Procedure 57-10, in which the Department prescribes the form to be used in executing agreements with the Department as to the write-off period.

Now let's see how this works out in actual practice.

Take a machine tool costing $10,000 that, according to Bulletin F, should be written off over a 20-year period. On that basis, at the end of eight years, the company buying this machine would have recovered through depreciation allowances $4,000 — less than half the cost of the machine. Meanwhile, the machine might have become obsolete.

Today, however, by setting up this machine as a specific depreciable item, the Internal Revenue Department *may* agree to a 16-year depreciation period instead of a 20-year period. By using the sum-of-the-digits option, the company buying this machine can recover three-fourths of the cost within the first eight years. In short, it could recover $7,500 in the first eight years, instead of only $4,000, as it could under the old practice.

Eight years is not too long a period to look ahead. It is, you might say, the reasonably foreseeable future. Many companies chart production plans that far ahead. If three-fourths of the cost of new equipment can be written off within that period of time, the capital risk is thereby that much lessened. Therefore some of these conservative financial-minded people who hesitate to spend money for replacement may be more likely to loosen up the purse strings.

There is still another approach to financial men that is, or certainly should be, effective. On every balance sheet there is an item called property, plant and equipment. That includes equipment at what is known as book value.

Now what is book value? It is the undepreciated portion of the cost of the equipment.

Well, let's go back to that $10,000 machine tool that is being depreciated under the old method over a period of 20 years. At the end of 10 years that machine stands on the company's books at a value of $5,000. But is it worth $5,000? Certainly not. It has long since been rendered

. . . *Continued on Page 55*

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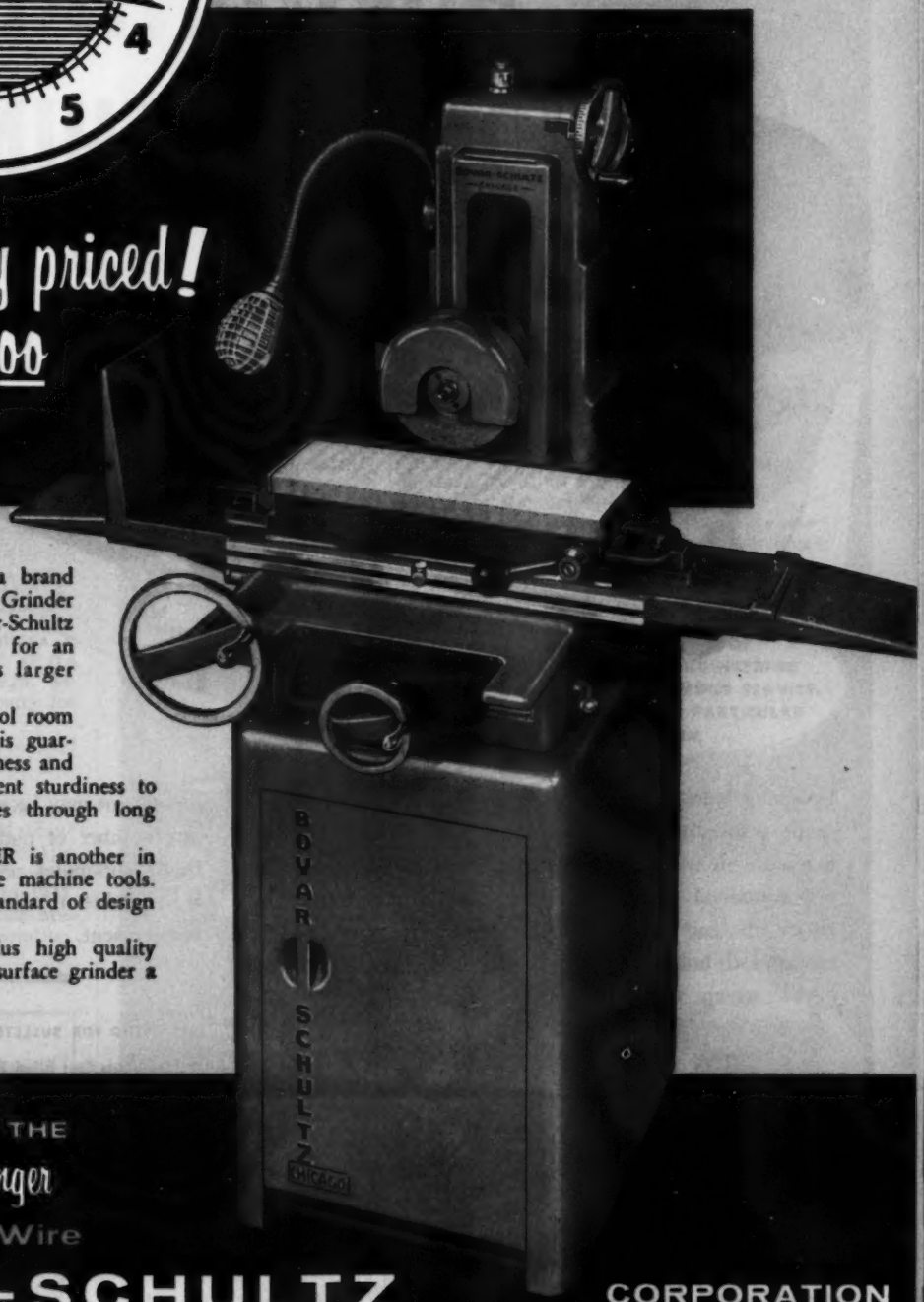

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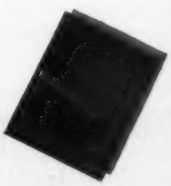

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CIRCLE INFORM-A-GRAM KEY NO. 54

. . . Month's Talk from Page 52

obsolete by a new model. It is actually worth only what it would bring in the second-hand market, and is probably in fact a liability instead of an asset, because it represents a continuing high-cost operation. Therefore a company which continues to carry obsolete machines on its books at book value is actually falsifying its assets to its stockholders.

Thus, you can see some of the financial considerations, entering into the purchase of equipment, that have literally nothing to do with the technical engineering features of the equipment.

And when you come to the question of the performance of the equipment, it isn't enough to show how beautifully it works. The $64 question is, how much money will it save? Will it add enough to the customer's profit to justify the expenditure?

That is why I say that engineers today must become cost-conscious and more profit-conscious. It is the engineers who are making obsolescence gallop. But let's make sure it is galloping in the direction of higher sales.

NECROLOGY

George A. Fyrberg, production manager of Norton Company's Abrasive Division, died suddenly Apr. 6. He had been with the firm since 1915.

Leonid A. Umansky, 66, retired manager of Systems Application Engineering for the General Electric Company, died at his home in Schenectady, N. Y., Apr. 3.

G. Donald Spackman, 61, vice president in charge of operations of Lukens Steel Company died at his Coatesville, Pa., home on Apr. 14. He had been with the company for 40 years.

Louis H. Hamilton, co-founder and chairman of the board of The Dumore Company, died Apr. 11.

Wendell E. Whipp, 73, chairman of the board of the Monarch Machine Tool Co., Sidney, Ohio, drowned Apr. 27 while fishing. He was president of the company from 1931 to 1947, and president of the National Machine Tool Builders' Association, 1938-39.

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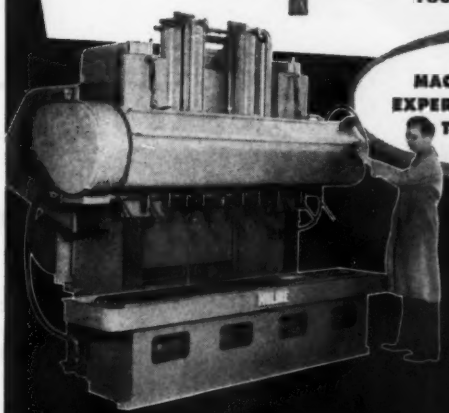
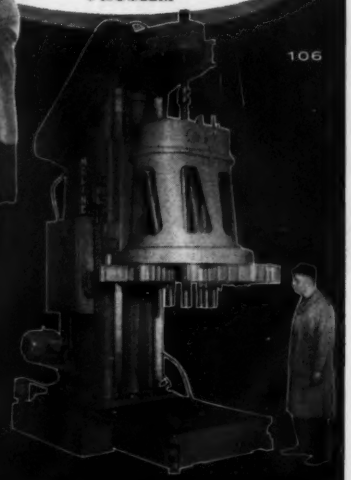


HD67 hydraulic rail feed, straight-line type, multi-spindle drilling machine. Six-foot rail length as shown; also available in eight and ten-foot lengths.



No. 116-U hydraulic rail feed, universal joint type driller with 16 two-speed and neutral top drivers plus four-speed quick, change gear box. Spindles illustrated are 1⅛" drill capacity each in mild steel.

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EVALUATION CONTAMINATION

WHENEVER FOREMEN are selected from hourly workers, evaluation — formal or informal — by other members of management is almost certain to be an important part of a selection procedure. In the May issue of *Tooling & Production,* we identified the major classifications of evaluation bias. In this issue, I am going to talk about one of these — *evaluation contamination* — the bias or error in an evaluation which results from having introduced into it elements which bear no relationship to performance in the position for which the worker is being evaluated.

One of the most universally encountered forms of evaluation contamination is seniority. In many instances, this is the only factor used to determine who will get an important promotion. I don't suppose that those who use seniority as a basis for promotion appreciate the fact that, so used, it constitutes an evaluation. Using seniority as a basis for promotion to foreman implies that the longer a man has been with the company, or on a given job, the more likely he is to succeed as a foreman. Up to a point, this is true. Plant, product, and process knowledge are things that are essential that every foreman have. If he possesses them at the time he is appointed foreman, he will begin to function sooner than if he has to acquire them after he is appointed. But the value of added experience beyond a given point is highly questionable.

For most first-line supervisory jobs in industry, I would guess that five years of experience is the maximum time needed to acquire all of the information and skills that the job has to offer in propelling a man for supervisory responsibility. The use of seniority beyond some such logical point is probably negatively related to the effectiveness of the man appointed. This is especially true in a plant that has experienced frequent lay-offs. In every lay-off situation I

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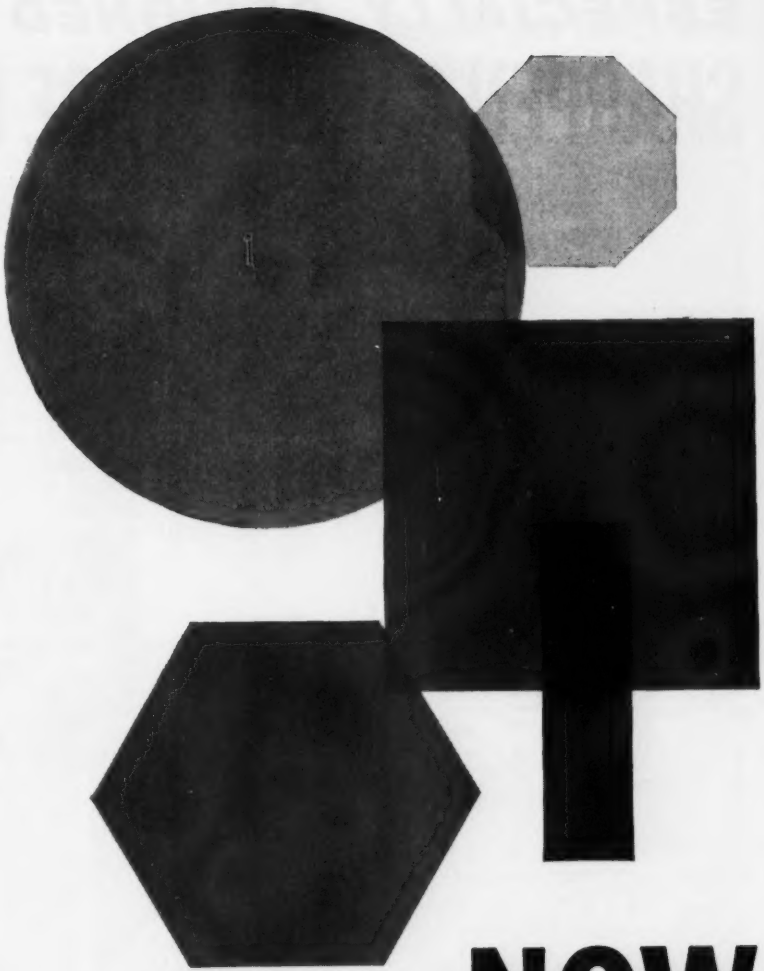

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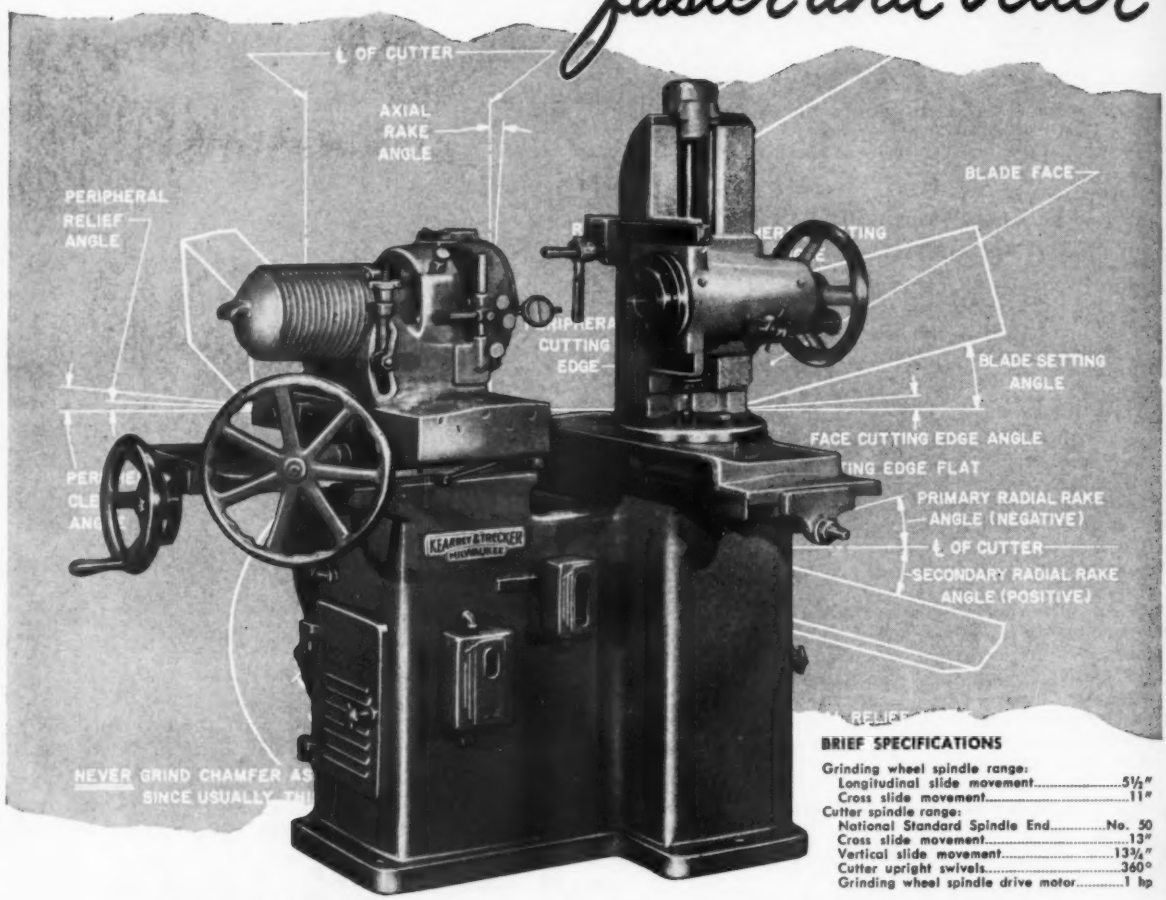

BRIEF SPECIFICATIONS

Grinding wheel spindle range:	
Longitudinal slide movement	5½"
Cross slide movement	11"
Cutter spindle range:	
National Standard Spindle End	No. 50
Cross slide movement	13"
Vertical slide movement	13¾"
Cutter upright swivels	360°
Grinding wheel spindle drive motor	1 hp

KEARNEY & TRECKER MILWAUKEE

FACE MILL CUTTER GRINDERS

handle all types of face mill cutters up to 24" in diameter. Accurate to 0.0002"

EVERY important feature you need for low-cost, efficient sharpening of carbide and H.S.S. face mill cutters are built into these Kearney & Trecker heavy-duty precision Cutter Grinders.

Handily located controls simplify operation. Graduated dials facilitate setups. Spindle flywheel helps maintain 3400 rpm constant speed during grinding. A jeweled-bearing dial indicator is furnished for checking finished cutter accuracy.

Three-inch to 7" dia. face mills attach to style "C" arbors and mount on the cutter spindle head. Cutters 8" to 24" dia. bolt directly to spindle nose.

Write for Bulletin G-10, Kearney & Trecker Corp., 6776 W. National Avenue, Milwaukee 14, Wisconsin.

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Designers and Builders of Precision and Production Machine Tools Since 1898

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White Star Mach. Co.
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Williams & Wilson Ltd.

CIRCLE INFORM-A-GRAM KEY NO. 591

. . . Evaluation from Page 57

have known, the best employees have found employment elsewhere during the lay-off period; only those with less ability return to acquire seniority.

But even where lay-offs do not occur and promotion is by seniority, the brighter and more competent young men — the men with leadership ability and ambition — are not content to wait until all of those with greater seniority have retired or died before they move into the management ranks. It is only those who lack the ability and ambition to forge ahead that last long enough to achieve the seniority needed for promotion in companies where it constitutes the sole or major basis for selecting a foreman.

The excessive use of seniority in foreman selection is a tool of a lazy or cowardly management. A management lacking the energy to devise a sound selection procedure is prone to fall back on seniority. Similarly a management that does not have the courage to defend its convictions with reference to the evaluation of candidates for a foreman's job, can avoid the need to defend a sound evaluation by telling the unsuccessful candidate, "We gave it to Joe because he has been here longest".

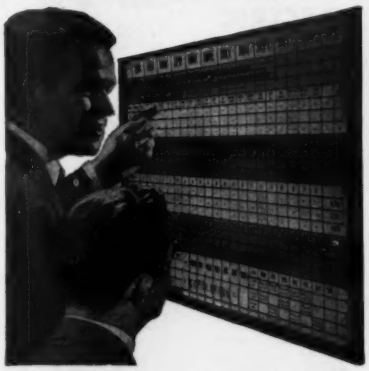
If you want to do a real job of foreman selection, don't become overly dependent on seniority. Determine what skills and knowledges are needed to perform the job you have in mind, and then find out the extent to which each of the candidates being considered possesses these. Don't make the naive assumption that merely added years of exposure on an hourly job will automatically increase a man's value as a foreman.

The next most important example of evaluation contamination is the error of assuming that the evaluation of performance for one job is equally applicable to another. Managements making this mistake have turned hundreds of good production workers into unhappy and ineffective foremen. This of course does not mean that only poor producers make good foremen, rather it means that frequently the factors that make for success or failure on a foreman's job are considerably different from those that are important at the hourly level. The man may be a good production worker because he enjoys working with his hands. Another may be productive because he is not particularly sociable and prefers sticking with his machine to mixing with his co-workers, a third produces because he is ambitious and wants to get ahead in the company.

Will these three high-producers make equally good foremen?

. . . *Continued on Page 60*

How To Get Things Done Better And Faster



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CIRCLE INFORM-A-GRAM KEY NO. 592

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A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

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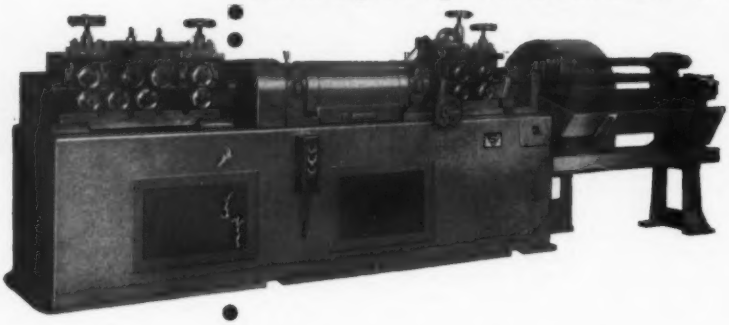
CIRCLE INFORM-A-GRAM KEY NO. 593

ALL ELECTRIC SHUSTER!

All-Electric Controls On Improved Wire Straightening and Cut-Off Machines



3AV - 1/4" to 1/2" basic wire feeds from 76 to 228 ft per minute

4AV - 3/8" to 11/16" basic wire feeds from 90 to 180 feet per minute

Two famous SHUSTERS, the variable speed 3AV and 4AV, now come equipped with all-electric controls! Each has two Reeves Variable Speed Transmissions for control of infinite speed of feed and speed of cut, positive release target operated by Micro-Switch, roll type clutch with solenoid control, and Warner Electric Brake on clutch shaft.

The result is *precision* production at every speed, and with finger-touch control. SHUSTERS are again first with the finest wire straightening and cut-off machines.

Write today for complete details.

send for free wall size split gauge wire chart from 41 gauge to 7/0

METTLER MACHINE TOOL, INC.
150 Adeline Street, New Haven, Connecticut

CIRCLE INFORM-A-GRAM KEY NO. 60

. . . Evaluation from Page 59

Of course not. Would the man who enjoyed working with his hands be equally satisfied with checking inventory, scheduling production and making out reports? Would he have the patience to tolerate and understand the poor performance of subordinates who did not have the native skills and the enjoyment of the work that had been his? I doubt it in most cases.

How good do you suppose the producer who avoided social contact would be at indoctrinating and training new workers, in handling grievances or dealing with the shop steward? Not very, I guess.

Does the fact that a man is not the top producer in the shop *prima facie* evidence that he would not be a good foreman? Suppose production work is routine and repetitive. Would the bright young fellow be apt to be as productive as a less well-educated, dull worker? Suppose the work demanded a high degree of eye-hand coordination, or the ability to make fast and accurate movements with the hands and feet in a coordinated fashion. These abilities are probably inborn and cannot be improved to any marked degree by training, but does this lack necessarily indicate a lack of the ability to get those who do possess the skill to use it well? Obviously not.

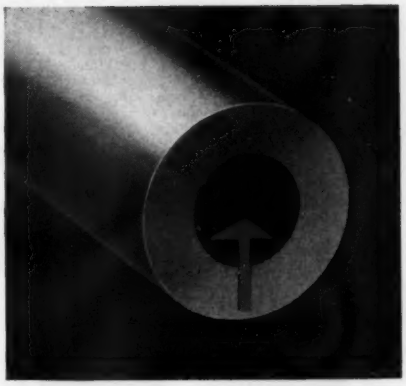
Many organizations still seem to cling to the old-fashioned notion that in order to supervise a group of people, it is necessary for the foreman to be able to perform any of the functions of his subordinates more adequately than they are able to. As management has grown to become both a science and a profession, the obvious untruth of this assumption has become more and more obvious. I cannot operate a typewriter half as well as any of the girls in my office, yet I am quite capable of determining what shall be typed, establishing the priorities of the various jobs, judging the work load and the number of people needed to perform it, and evaluating the merit of the product of the secretaries and typists.

I have seen many instances in industry where individuals with adequate supervisory skills were placed in positions in which they have very limited experience or technical knowledge, and yet were able to clean up the supervisory mess that had been created by the predecessor who was an expert operator but not a manager.

Don't make the mistake of assuming that the adequacy of performance on one job necessarily means an equal adequacy of performance on another job which may involve an entirely different kind of work. And don't look upon promotion as a reward for outstanding services. If you do, you will frequently be rewarding

. . . Continued on Page 62

a hole here makes waste...



a hole here saves waste

Crucible Hollow Tool Steel cut sections eliminate the waste and cost of drilling out solid rounds to make ring-shaped or tubular steel parts, or tools with a center hole. By using these hollow bar sections, cut to length, you do away with unnecessary cutting, drilling, and boring operations, increase machine capacity, and cut scrap losses.

These hollow sections, in just about any O.D. and I.D. combination, or thickness you want, are *immediately* available in five most popular Crucible grades: KETOS oil hardening, SANDERSON water hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air hardening, and NU DIE V hot-work tool steels.

Call your nearby Crucible warehouse for more information, or for speedy delivery. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

CIRCLE INFORM-A-GRAM KEY NO. 61

HOW TO KNOW ALL THE ANSWERS . . .

WHEN THE QUESTION IS *Marking!*

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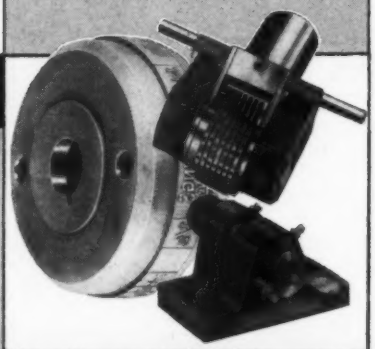
MACHINERY

Production efficiency and economy is assured with Parker recommended, Parker built marking machines—standard or custom.

MARKING
TOOLING

Parker marking specialists will suggest, develop, deliver the tooling and fixtures your job and equipment demands to keep production up, costs down.



MARKING
METHODS

The Parker design and engineering staff stands ready to make your "impossible" marking applications routine, routine applications far more efficient.

When marking speed . . . adaptability . . . precision . . . legibility . . . or economy is a problem, Parker has the answer. Let Parker put a marking expert in your plant, let 85 years of marking experience help YOU. Send information on your marking equipment needs for prompt advice—ask for the helpful Parker catalog, too.

THE PARKER-HARTFORD CORPORATION by Parker
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CIRCLE INFORM-A-GRAM KEY NO. 62

. . . Evaluation from Page 60

success with failure. A man should be offered a supervisory position because the facts indicate he is likely to succeed in it. Unless this is the case, those responsible for the promotion are doing a disservice to both the men and the company.

In this article, we have discussed two common evaluation contaminants, seniority and unrelated job performance. There are of course many, many others and we will look at some of the more important of them the next time.

DANA JEFFERSON HEADS NSMPA

Dana B. Jefferson, Jr., partner of the Walker Manufacturing Co., Medford, Mass., was elected president of the National Screw Machine Products Association at the group's recent annual meeting in Washington.

The newly-elected vice president is C. J. Baumgart, president of Screw Machine Engineering, Inc., Chicago. Leonard R. Schaffer, president of Mechanical Art Works, Inc., Newark, continues as NSMPA treasurer; Orrin B. Werntz, as counsel and executive vice president; and Margaret S. Ballinger, as secretary.

New trustees include Francis B. Trinkhaus, president, Crellin Machine Co., Los Angeles; Elwood Leonard, partner and general manager, H & H Screw Products, Inc., Providence, R. I.; Charles L. DeMartin, president, General Screw Products Corp., Rochester; and Charles L. Kerr, president and treasurer, Kerr-Lakeside Industries, Inc., Cleveland.

President Jefferson has been a member of the NSMPA board of trustees, and was vice president and a member of the executive committee during the past year. He has served as chairman of its Eastern New England district, chairman of the national cutting fluids sub-committee, and is currently a member of the public relations, machine tool, and finance committees.

Purchase of the manufacturing and sales rights of the Versa-Mil line of portable precision machining units has been announced by Dumore Co. of Racine, Wis. To be known as the Dumore Versa-Mil, the machine is an attachment for lathes and other machine tools.

Automate

A STEP AT A TIME

The pot of gold at the end of the automation rainbow seems far beyond the reach of many a manufacturer when he thinks of the capital investment required to build an automatic factory.

But he can take it step by step with minimum capital investment, and without loss of time.

Most of the needs of automation can be met by the application of simple control mechanisms coupled with a measure of ingenuity.

The Bellows Co. manufactures control mechanisms to turn standard machines and machine tools into high production automatic units. When desired, we'll even furnish the measure of ingenuity!

Phone your local Bellows Field Engineer, ask him to sit down with your production men. No cost. No obligation. Automate step by step.

Take this step, first–

Write for a copy of Bulletin ML-3. In its pages are ideas you can quickly put to use. No cost. No obligation. Address Dept. TP-657, The Bellows Co., Akron 9, Ohio. In Canada, Bellows Pneumatic Devices of Canada, Ltd., Toronto, Ont.

Over 125 technically trained Bellows Field Engineers in the United States and Canada are at your service.

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CIRCLE INFORM-A-GRAM KEY NO. 63

After thorough research, development and tests . . .

The very first in its field!

NewMet*

by NEWCOMER

Neither a ceramic... nor a tungsten carbide... but an all-new high-velocity metallic cutting material

△ □ ○ NewMet by Newcomer has opened a new field of high velocity cutting in metal-working. A product of Newcomer research and development over the past ten years, this new material is capable of cutting performances beyond the capacities of present machines. Its extreme hardness (Rockwell "A" 95), combined with a comparatively high strength, gives NewMet the ability to perform superbly at both normal carbide cutting speeds or at speeds within the range of ceramic-type cutting tools.

Typical NewMet* PERFORMANCE DATA

1 Turning Low Carbon Steel			2 Turning Medium Carbon Steel			3 Turning Stainless Steel (Magnetic Type)		
SPEED	DEPTH OF CUT	FEED	SPEED	DEPTH OF CUT	FEED	SPEED	DEPTH OF CUT	FEED
1000 to 1500 SFPM	.001" to .090"	.001" to .012"	900 to 1200 SFPM	.001" to .090"	.001" to .012"	800 to 1500 SFPM	Up to .100"	.007" to .010"

Economize now with high-velocity cutting . . . use *"Years Ahead"*

NewMet* by NEWCOMER

NewMet is available in "Throway" triangular, square and round inserts, and solid cylinders. Call your nearest Newcomer representative for complete data, or contact

*Pat. App. for.

NP

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Call: CHurchill 1-4060

Sales Offices are located in principal cities

CIRCLE INFORM-A-GRAM KEY NO. 64

Coming Events

June 5-7. Bureau of Apprenticeship & Training, U. S. Department of Labor. Apprenticeship Conference. York Harbor, Me.

•

June 9-12. National Industrial Advertisers Association. 35th Annual Conference. Waldorf Astoria Hotel, New York City.

•

June 9-13. International Automation Conference and Exposition. Coliseum, New York City.

•

June 9-13. Military Automation Exposition. Trade Show Building, New York City.

•

June 9-14. Pennsylvania State University. Third Show Building, New York City.

•

June 9-14. American Society of Mechanical Engineers. Semi-Annual Meeting. Sheraton Palace Hotel, San Francisco.

•

June 10-11. Radio-Electronics-Television Manufacturers Association. Hotel Syracuse, Syracuse, N. Y.

•

June 10-14. New York University. Vacuum Metallurgy Course. NYU Campus, University Heights, N. Y.

•

June 10-21. Illinois Institute of Technology. Shaped Diamond Tool Course. Illinois Tech, Chicago. Registrations due by May 31.

•

June 11-13. Third Western Plant Maintenance & Engineering Conference and Show. Civic Auditorium, San Francisco.

•

June 11-14. Cornell University. Annual Industrial Engineering Seminars. Ithaca, N. Y.

•

June 13-14. Society for Advancement of Management. Material Handling Conference Statler Hotel, New York Cty.

•

June 13-14. Society for Advancement of Management. 2nd Annual Material Handling Conference. Hotel Statler, New York City.

•

June 14. Pressed Metal Institute. Second Annual National Sales Conference. Hotel Carter, Cleveland.

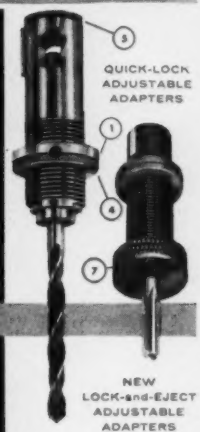
•

June 17-21. American Society for Engineering Education. Annual Meeting. Cornell University, Ithaca, N. Y.

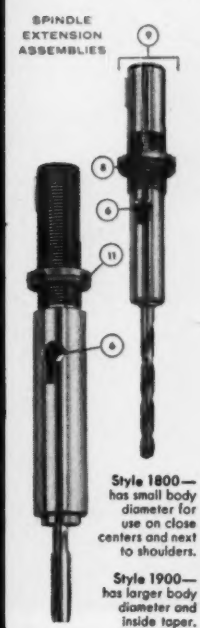
Scully-Jones Adjustable Adapters

FOR PREMIUM PERFORMANCE OF DRILLS, TAPS, REAMERS

AT NO PREMIUM IN PRICE!



These benefits . . .	for these reasons . . .	result from these PREMIUM features
INCREASED ACCURACY	No "cocking" or spindle distortion	1. Top face of quick-lock nut is square with threads.
		2. Locking shoe assures even distribution of pressure on all mating threads.
	Cutting tools run true	3. Bore and shank are concentric within .002 in. gaged 6 in. from adapter.
INCREASED PRODUCTION	Faster adjustment	4. Quick-lock nut locks any place on thread by only ¼ turn of set screw.
	Faster tool changes	5. Pilot nose eliminates "binding."
		6. Keyhole-type drift slot simplifies tool ejection.
		7. New Lock-and-Eject type eliminates use of conventional drift.
LOWER TOOL COSTS	Full use of adjustable range of adapter	8. Quick-lock nut is thinner than nuts used on most adapters.
		9. Small diameter permits use on close centers.
	Reduced tool breakage	10. Keyhole-type drift slot eliminates need for hammering with conventional drift.
	Adapter lasts longer	11. Friction-type nut prevents thread damage. Set screw does not contact threads.
		12. "Stressproof" steel induction hardened to give best combination of wear resistance and toughness.
	Solve pull-out problems	13. New Lock-and-Eject type increase holding power.



Style 1800—has small body diameter for use on close centers and next to shoulders.

Style 1900—has larger body diameter and inside taper.

SCULLY JONES

Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

PRECISION HOLDING TOOLS

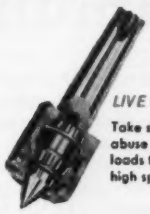
"Precision Holding" for holding precision

Scully-Jones and Company 1913 South Rockwell Street, Chicago 8, Illinois

for profit-minded tool buyers!

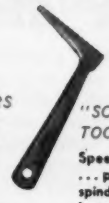
COUNTERBORES and COUNTERSINKS

Give you rigidity and concentricity needed for accurate work, longer life.



LIVE CENTERS

Take shock and abuse of heavy loads turning at high speeds.

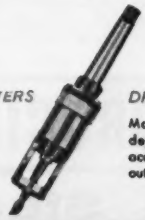


"SCULLY-DRIFT" TOOL EJECTORS

Speed tool changes . . . protect tools, spindles, and bearings. Twist-of-the-wrist ejects tool or holder.

CENTER DRILL DRIVERS

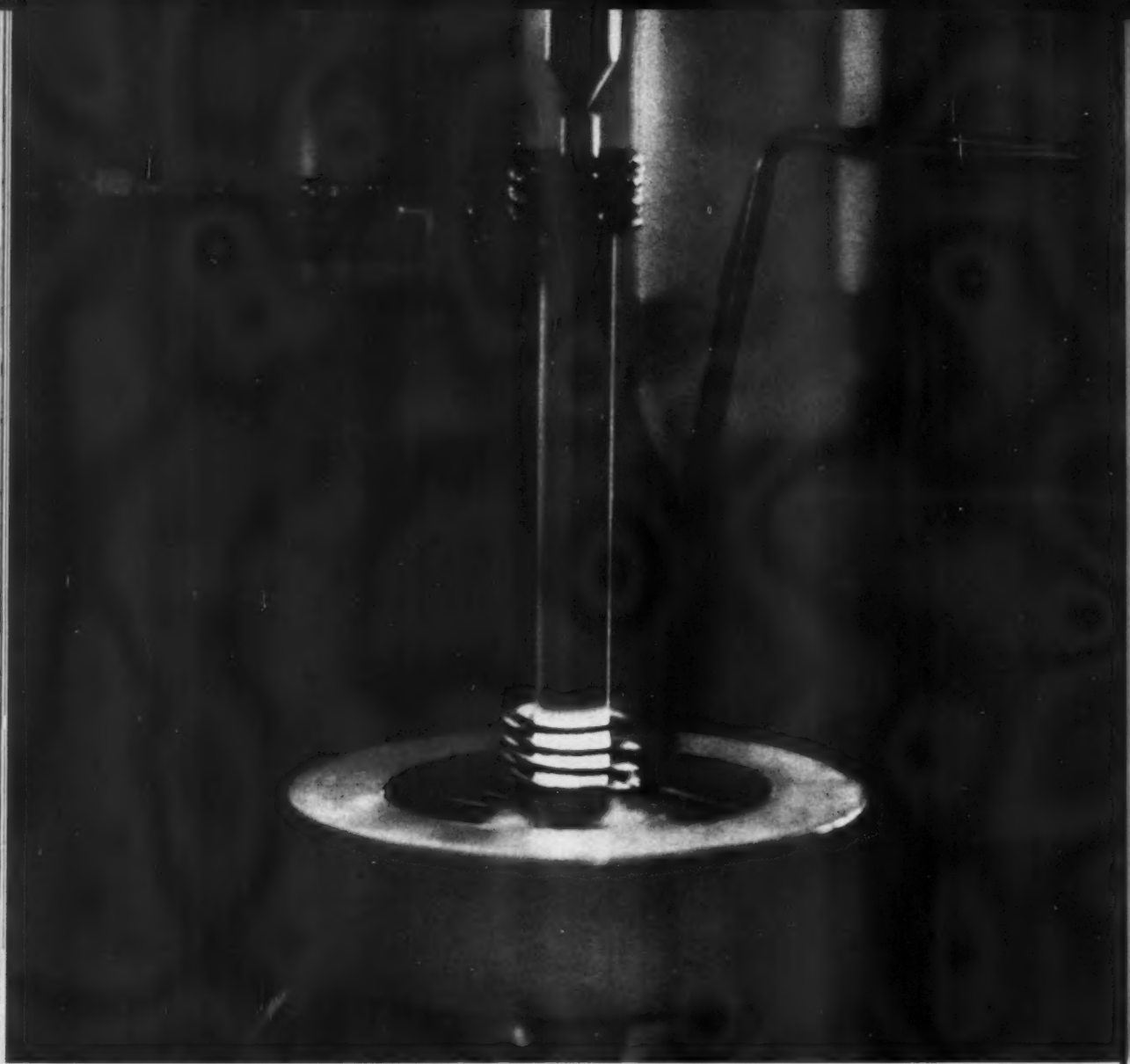
Offset splined section gives positive drive in drill flutes and protects cutting edges.



DRILL STOPS

Make control of drill depth simpler, more accurate. Sleeve snaps out for fast tool change.

CIRCLE INFORM-A-GRAM KEY NO. 65



Ketos shaft being induction hardened to Rockwell 55-56, while ends remain soft for final machining. Photographed at Control Instrument Co., Inc., Brooklyn, N. Y.

KETOS has wide hardening range with minimum volume change...

Ketos is a low priced alloy tool steel that can be hardened from low temperatures with practically no volume change. It has deep hardening qualities, and a fine grained structure, that make it desirable for many production parts.

That's why nondeforming Ketos is well suited not only for most tool steel applications such as gauges, dies, and taps but also for close-tolerance, wear-resistant parts like the actuator bar shown in the induction heating unit above. The thin contact edges of this particular part withstood a "life test" of over 4-million high speed blows. No other steel tested lasted more than 1-million cycles before it chipped and failed.

If Ketos sounds like the steel you should be using, call your nearby Crucible warehouse. Stocks of Ketos and dozens of other special tool steels are large, delivery fast. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor—Railway & Power Engineering Corp., Ltd.

CIRCLE INFORM-A-GRAM KEY NO. 66

Presenting . . . Representing . . .

J. L. Axelson Co. has taken over as sales and engineering representative in southern California for Colonial Broach and Machine Co. The company will represent the complete line of machine tools, cutting tools, and components produced by Colonial and two of its domestic affiliates.

•

D. Nast Machinery Co. is the new Philadelphia area dealer for presses produced by the Hamilton Division of Baldwin-Lima-Hamilton Corp. Its territory includes eastern Pennsylvania, southern New Jersey, and Delaware. The new Atlanta area sales representative for these presses is Frank O. Walsh, Jr. The A. V. Wiggins Co., Inc. has taken over as the Syracuse, N. Y., area dealer for the BLH Hamilton Division presses.

•

Lovejoy Tool Co., Inc. has announced its appointment as distributor for Degussit honing stones.

•

Lincoln Industries Co. of Minneapolis is the exclusive national distributor of the Empire lapping machine.

•

Diamonite Products Mfg. Co. has named John G. Maiers Sons of Baltimore, Md., as distributor for its oxide cutting tools in the Baltimore area. In addition to the cutting tools, Maiers will also handle the Superigid toolholder.

•

Giddings & Lewis Machine Tool Co., manufacturer of heavy-duty precision machine tools, has named Dayton & Bakewell of Los Angeles, exclusive southern California distributor for its G & L and Hypro Division. Dayton & Bakewell will sell and service G & L horizontal boring, drilling, and milling machines; accessories; and attachments.

•

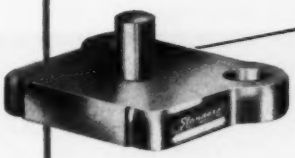
Marshall & Huschart Machinery Co. of Chicago is serving as the exclusive distributor for the line of mechanical presses produced by Danly Machine Specialties, Inc. The area covered includes northern Illinois, Wisconsin, Iowa, western Michigan, and northern Indiana.

•

The new sales representative in the Rocky Mountain area for the industrial products line of the Abrasives Division of Elgin National Watch Co. is Spicer-Lindsay Associates of Denver, Colo. The firm will handle sales of diamond compounds, carbide rotary tools, diamond saws, and Elgiloy spring materials. They will serve Colorado, Utah, Wyoming, and New Mexico.

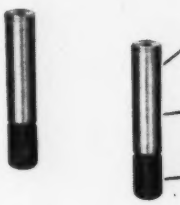
Stan the die set man says:

These details make the difference...



Punch and die holders fully stress relieved — when you lay out work on a "Standard" die set, the dimensions "stay-put" because "Standard" uses a metallurgically correct stress relieving process which produces great dimensional stability.

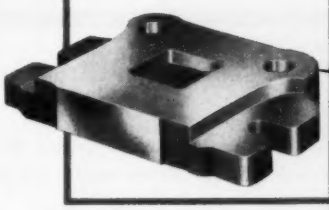
Bushings — hardened, ground, and honed — provide full-length bearing for longer wear. Pre-shrunk in deep freeze for stress-free assembly into punch holder.



McVey Design Precision Posts (pat. applied for) for fast, easy assembly and disassembly of die sets — without hammering or pounding.

Posts chrome-coated for low friction and long wear.

Posts pre-shrunk in deep freeze for precision assembly into die holder holes. Bond of post in plate helped by Pentrate finish of post end.



Special Machine Work further stress relieved for added assurance of dimensional stability and precision fit of posts and bushings.

Send for Die Set Comparison Chart and see for yourself why experienced tool and die makers specify and insist on "Standard" every time.

YES, there's a difference in die sets and "Standard" makes the difference!

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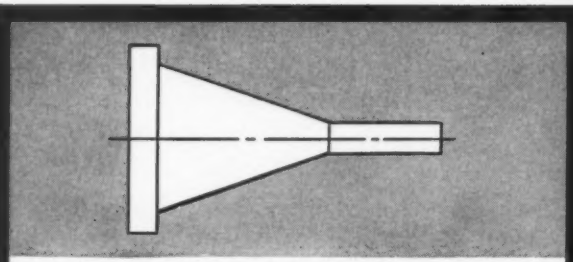

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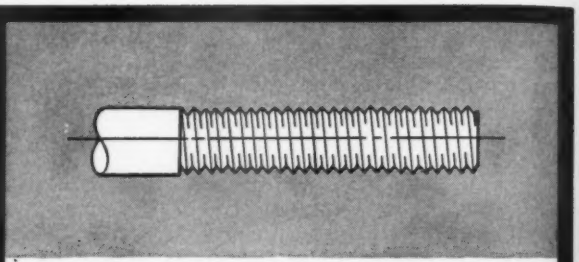

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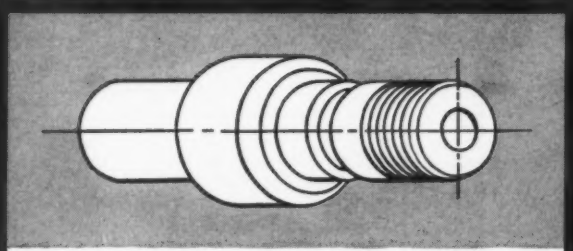
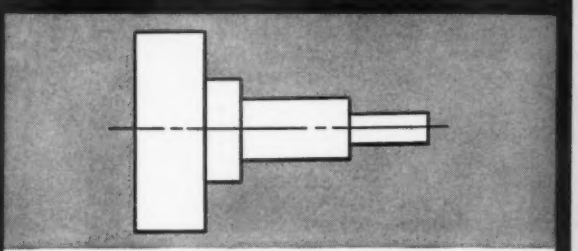


Machine parts like these using optional turret tool block mounted on compound rest slide.



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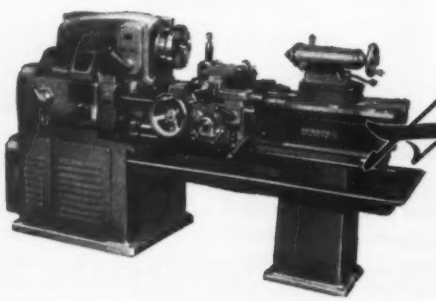

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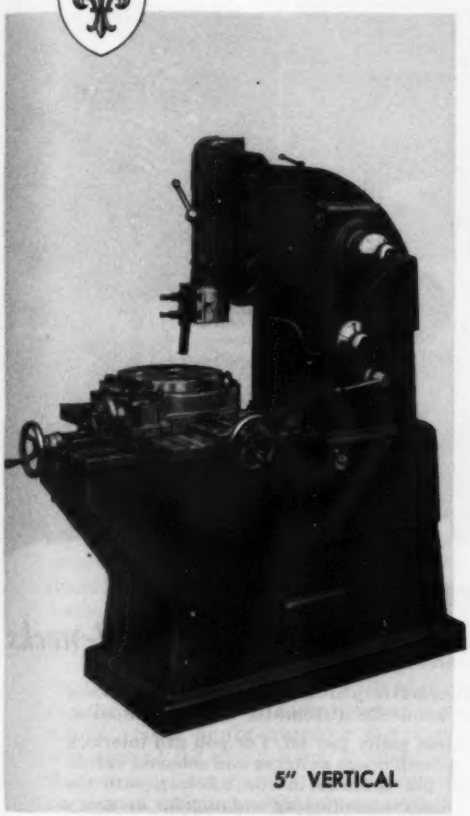

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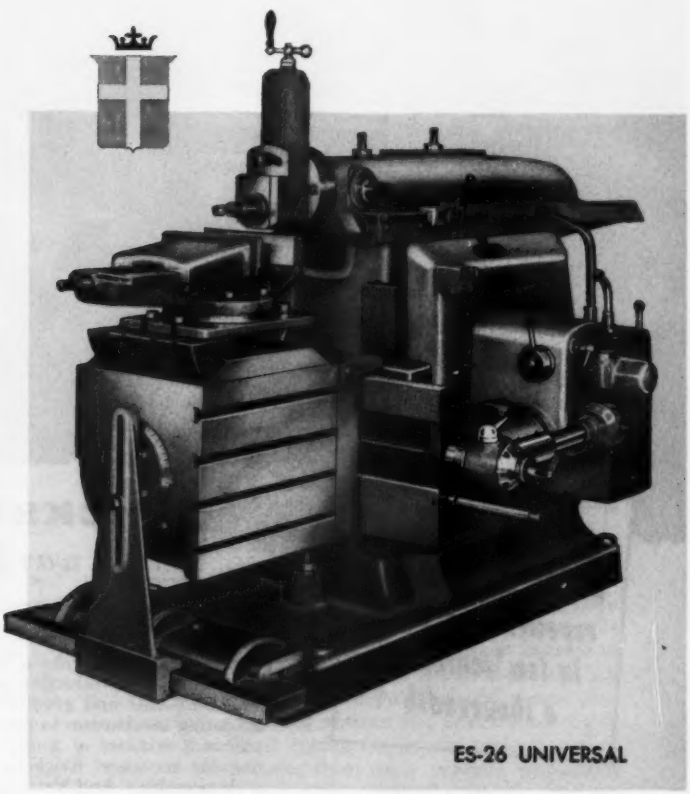

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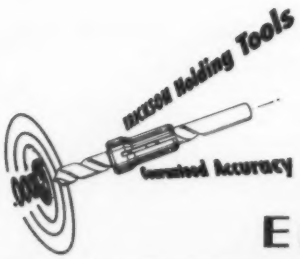
Speed to keep lines moving . . . accuracy to reduce rejects . . . long life to cut maintenance and capital investment—all add up to Erickson Indexers, the *economical* way to smash automation bottlenecks.



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editorial:

Quotes From The Forum

ANOTHER YEAR has rolled around with the holding of the 21st Annual Westinghouse Machine Tool Electrification Forum last April. It has been three years since we devoted this page to pertinent quotations from speakers and panel members. We believe you can read between their lines of things to come.

"Although specific obsolescence cost data for the automotive industry as a whole is not available, certain estimates which we feel are reasonable place the total cost of obsolescence at about $320,000,000. During the past three years, the cost of facilities actually retired is estimated to be approximately $80 million. During this same period, product design changes in the industry have required an expenditure of an estimated $240 million additional to rework existing facilities and purchase new machines. This outlay of over $300 million in the automotive industry during a three-year period requires that management carefully consider all possible methods of reducing the cost of future obsolescence."

J. F. Randall, Ford Motor Company

"Teleological control is a new concept in the field of automatic controls. They are unlike conventional controls which force the controlled process to conform to their instructions. A teleological control is allowed to experiment with the process until it finds the goal as determined by a set of built-in rules."

Albert J. Kerstukos, Westinghouse Electric Corporation

"Recognizing that no satisfactory set of standards now exists for electronic equipment and that standards are badly needed, let us list a few of the advantages we can hope to gain: (1) protection of purchaser and vendor; (2) increased useful life; (3) reduced downtime; (4) consistent and predictable performance; (5) simplified operation and maintenance; and (6) safer operation for personnel.

"Our group at GM Process Development ran head on into this problem a few years ago when we farmed out the construction of some equipment we had designed. Some of the questions that arose, and the way some of the circuits came in, made it quite clear that we could not possibly put adequate information on a set of drawings. We then proceeded to write a set of standards of limited scope. Since that time, we have set up an electronics committee in General Motors. One of the tasks before this committee is the writing of a proposed set of standards for industrial electronic equipment."

R. B. Colten, General Motors Corporation

"Today, among many new materials available to motor manufacturers, there are wire enamels such as Formvar, Bondar, other synthetics and modified silicones; there are varnish resins such as the phenolics, alkyds, polyesters, epoxies, silicones, and others; there are films such as polyethylene, nylon, Mylar, Teflon, Kel-F, and others; there are fibers such as rayon, nylon, Orlon, Dacron and others. All are clamoring for attention. On their part, motor manufacturers want to use them to achieve smaller, more reliable, or less costly motors."

G. P. Gibson, Westinghouse Electric Corporation

"Let us consider the challenging field of automatic control, which has been so greatly advanced in the past decade, largely because of massive governmental programs in the aircraft and missile fields. In this area, statistics, non-linear servomechanisms, and analog and digital computer techniques have moved far beyond their present use in the machine tool field. For example, work done in the missile field in applying discontinuous automatic control theory to the determination of hit probabilities — that is, what probability the missile has of hitting its target — can be carried over to the machinery and gaging field as the probability of producing a product within certain limits."

Arthur H. Wolfson, Pratt & Whitney Company, Inc.

"It is generally recognized that concepts basic to the transfer press can increase productivity greatly when applied to lines of presses. Since the key to this approach is synchronization, it is worthwhile to consider several basic methods for attaining synchronization."

Gordon M. Sommer, Clearing Machine Corporation

"Both users and builders of such production equipment as automatic machine tools, transfer machines, gages, and assembly machines are aware of the problems involved in installing this equipment so that it is equal to production requirements. Equally pressing are the problems involved in seeing that this equipment continues to operate at proper efficiency. Further, problems arise when similar machines fail to operate alike. All these problems necessitate the development of new methods and tools for 'debugging' new equipment and for maintaining it after it is once set up."

Kirk E. Birrell, The Sheffield Corporation

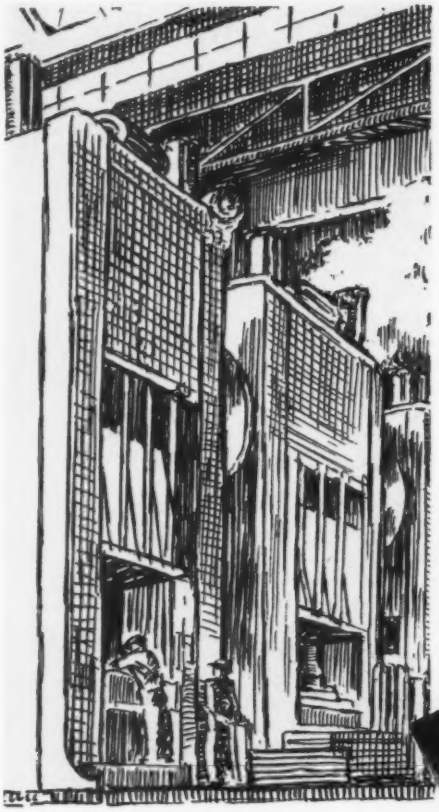
"Applications of transistors to such large-scale projects as commercial and military computers, missile systems, and the earth satellite continue to increase in scope and number. They are made where the advantages of decreased weight, size, and power consumption are needed without any sacrifice in reliable operation. Such confidence in the performance of the transistor stems from many separate evaluations of transistors in various circuits."

George H. Royer, Westinghouse Electric Corporation

The Forum, and particularly the question and answer sessions following each speaker as well as the coffee breaks, is really a programmed brainstorming session of no small magnitude. We would be very remiss not to credit the Westinghouse Electric Corporation with a major, annual contribution to the exchange of ideas between machine tool builders and users.

E. Willard Pennington

editor



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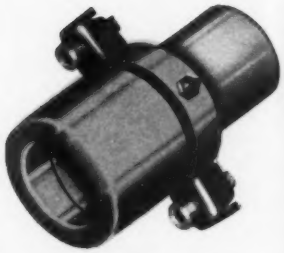

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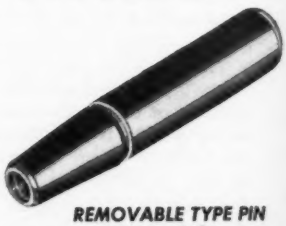

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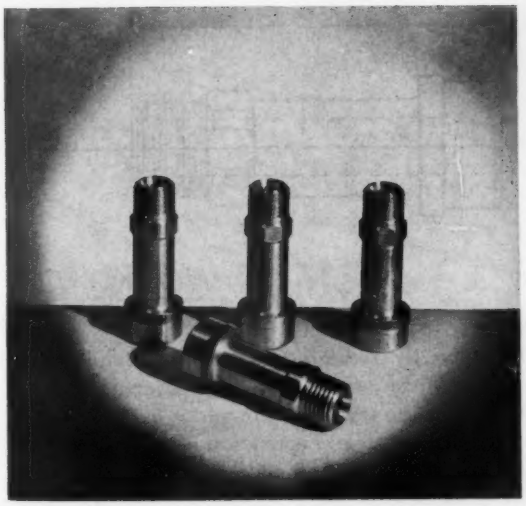
Job shops cannot indulge in costly and time consuming secondary operations and setups. Here is a job which, at first thought, calls for either secondary sawing, milling, or pick-off and rechucking. Competition forced a second thought. Result: broaching the piece while it revolves and reducing the time per piece to 3.25 seconds.



External Broaching on Automatic Screw Machines

by C. F. Van Raaphorst
Plant Superintendent
Waterbury Manufacturing Co. Division
CHASE BRASS & COPPER CO.
Waterbury, Connecticut

BROACHING ON AUTOMATIC SCREW machines has always presented complex problems that are sometimes difficult to overcome. The operation is generally limited to either brass or aluminum and of necessity requires a great deal of ingenuity on the part of both the screw machine engineer and the machine operator.

Primarily limited to internal metal removal on automatic screw machines, broaching can also be successfully accomplished on outside surfaces and could lead to new ideas in efficient parts manufacture.

External metal removal to produce irregular forms, such as squares or hexagons, is generally accomplished by either milling or sawing off the excess metal by the secondary operation procedure. On automatic screw machines it is often done by stopping the spindle while the saws or milling cutters, held in special attachments operating from the tool slide, advance to do their work. In some cases both the saw holding device and the work are rotated to produce the desired results.

The pick-off method is also used for slotting or milling. This operation is performed by a pick-off attachment that rechucks the piece after cutoff for milling, slotting, or drilling.

Often these methods require special machine adaptation and would prove efficient only in the case of standard items of manufacture that are in continuous production.

Aside from being costly, the conversion of a screw machine to this type of production is time consuming and finds no place in the average jobbing shop.

The amount of metal that can be removed by the broaching method is, of course, limited. However, in many cases the part can be redesigned to provide a minimum of strain in the

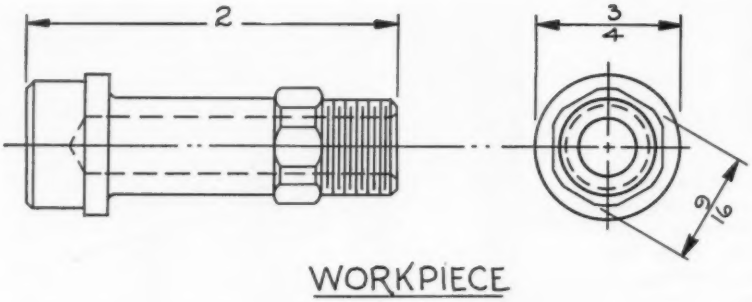


Fig. 1. Producing the wrench flats on this screw machine product by a secondary milling operation proved too costly. The solution was to broach the flats while the work revolved.

machine by reducing either the diameter of the item to be broached or shortening the length of the irregular shape.

Machine size and condition is of primary importance in deciding whether the article can be broached or not.

The title photograph portrays the brass screw part, Figure 1, that was laid out to be produced on a 1" New Britain Model 60 screw machine. The secondary milling operation was first decided upon to generate the hexagon flats which were to be used as wrench flats in an assembly operation. The milling operation proved too costly to meet competition with the result that a more inexpensive method had to be found. It was finally decided to broach the piece on the screw machine.

Broach design was important as well as the design of the item. It was found that the diameter of the screw machine blank could be reduced somewhat so that less metal had to be removed by broaching.

The broach, Figure 2, was mounted in a standard live drill spindle revolving at the same speed as the machine spindles. The drill spindle holder was backed up with a holding block to prevent it from pushing back. It was necessary to tighten the collets slightly more than customary in regular machine operation.

Pertinent data of the layout used is shown in the accompanying table.

JOB LAYOUT DATA

Machine: 1" New Britain, Model 60
Spindle rpm: 2804 **Speed gears:** 8-139 **Feed gears:** 65-55
Lead cam: 7/8"—0.0074" feed
Gross production: 1105 pcs/hr **Time, one piece:** 3.25 sec

OPERATIONS

1st position: drill & countersink—tool slide—7/8" cam—rough form, 3/16" cam—0.125" rise—0.0014" feed.

2nd position: drill—tool slide—7/8" cam.

3rd position: drill—tool slide—7/8 "cam finish form, 1/4" cam, 0.167" rise, 0.0018" feed.

4th position: broach, use rotating broach head—tool slide—7/8" cam.

5th position: thread 18 pitch, auxiliary slide front—18 pitch threading cam.

6th position: seat—auxiliary slide back 3/8" cam, 0.004" feed. Cut off, 3/8" cam, 0.375" rise, 0.004" feed.

As shown in Figure 2, the design of the broach was relatively simple. Sufficient clearance had to be allowed to produce the desired results but the land left on the tool held eccentricity to a minimum.

Many thousands of pieces were produced by this method and the idea of external broaching will be given serious consideration whenever a similar problem arises.

end

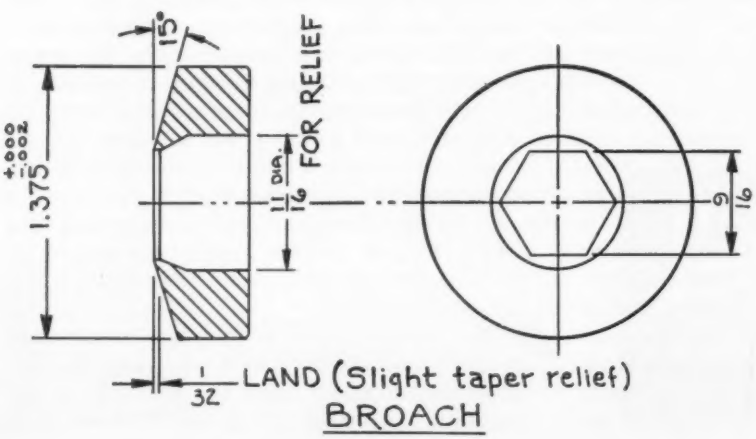


Fig. 2. The external broach designed to produce the flats shown in Figure 1. The broach revolves at the same rpm as the work spindle. Eccentricity is held to a minimum by the land left on the tool.

Automatic Production of 36 Different Parts on One Machine is Facilitated by Color Coding of Spacer Blocks.

COLOR CUTS DOWN TIME

by
William H. Somerwill
Plant 3 Supt.
RELIANCE ELECTRIC AND ENGINEERING COMPANY
Ashtabula, Ohio
as told to
William E. Hoffman
Associate Editor

A SPECIAL TRANSFER MACHINE that completely machines any one of 36 different motor frames, from 1 to 40 hp, is one of numerous technical achievements at the new Reliance Electric and Engineering Plant No. 3, Ashtabula, Ohio.

Before the contract for the Sundstrand machine was placed, we studied proposals for 3 months. The proposals, from a number of builders, centered around the trick of building a machine that could turn out a predetermined frame after feeding a rough casting in one end. On each frame both sides were to be faced, various diameters bored, feet milled (if the frame was to have feet), and all holes drilled and tapped where required.

The big design problem was, "How to handle 36 different parts?" This was simplified by color coding. Six colors were used throughout the machine to represent diameter and length combinations spread over 3 basic frame sizes. As seen in Figure 2, each spacer or dog is either

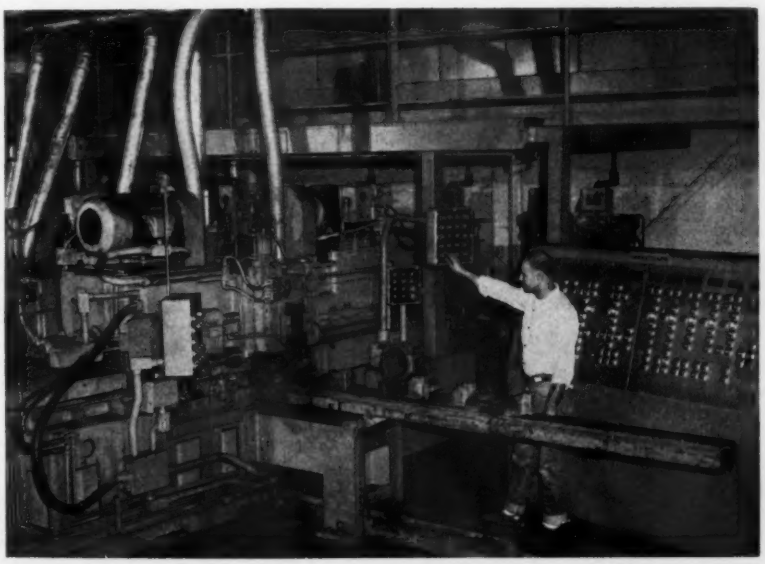


Fig. 1. Reliance machines 3 diameters of motor frames on its transfer machine. Here 3 different fixture sizes are seen attached to the work transfer shuttle.

in place or swung up (one is swung up) in accordance with the desired stop position of the head as it feeds in to the work. The stop position is respective to the motor frame being machined.

Color meanings are carried throughout the rest of the machine to bring into play the proper stop-dogs, and to guide the set-up man in selecting the appropriate boring bars or tooling blocks from the "tool board" where they are stored.

By the use of color coding the operator can quickly and surely set the 12-station machine for any specific run of parts. And, by proper scheduling or cascading the various lengths in batches within a frame size, economy can be a reality even when the batches are of only a few dozen pieces, because it takes only one hour to reset the machine from one frame length to another. A complete change from frame size to frame size takes about 9 hrs. This easy change-over is facilitated by individual pendant control for individual station checkout before a trial part is sent completely through all stations and inspected.

For facing, the tool bits are set in a removable tool block (one tool block will face all frames which have the same length) which is bolted and doweled in place. The bits are set in relation to the block locating surface by a master gage at the machine.

For boring, multi-bit holders are used having 16 insert type bits which are ground to size in the toolroom. By standardization of product only 6 bore sizes are used, and thus only 6 cutting heads are necessary for all 36 motor frame sizes.

To simplify drilling, the hole patterns in the various frame sizes were correlated with each other during the machine design conception. This led to a minimum of hole pattern variation and fewer drilling stations. For instance, the six hole patterns (4 holes ea.) for the feet are handled by a multi-spindle drill head. The head can index and only 2 of its spindles are loaded for use at a time. If frames are to be footless a "lock out" arrangement immobilizes Sta. 5 and Sta. 6, where the feet are milled and drilled.

By using the same mounting hole spacing on all conduit boxes, Sta. 10 can drill and tap these holes in all frames.

Each building block or machining unit has its own independent hydraulic system. In this way trouble can be pinpointed on the console by pressure switches activating respective lights on the control console. Most cutter feed

The mode of operation of this new machine — running the parts through in like batches — is in keeping with the Reliance philosophy of building parts for stock, to be assembled later to customers' requirements.

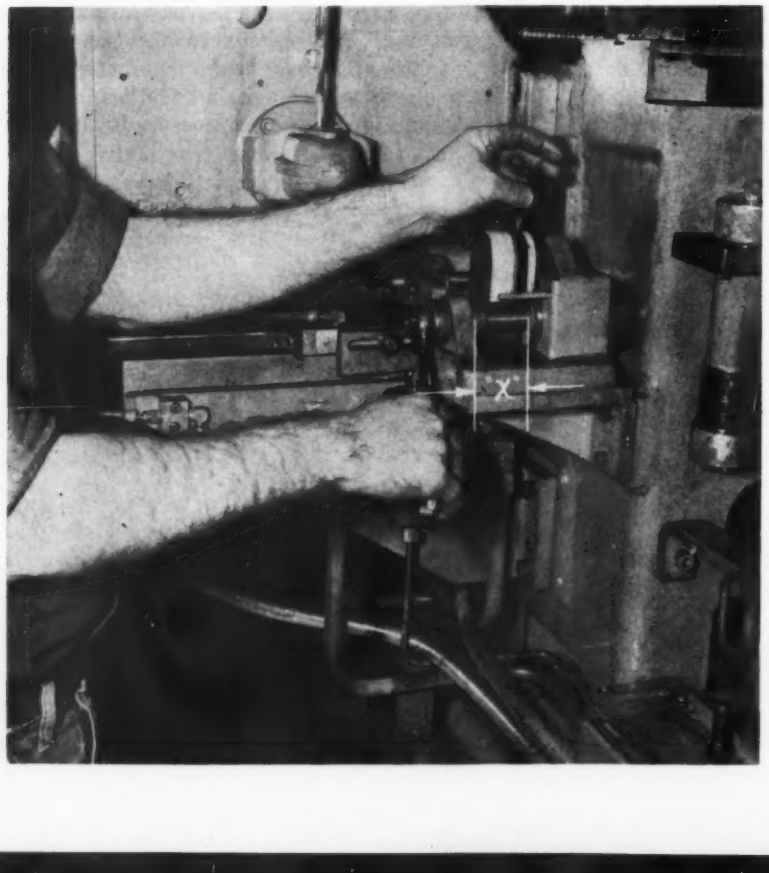


Fig. 2. By colored spacers the distance "x" is varied to suit the depth of cut necessary for the frame being machined. The operator here is using all the spacers for this setup except the one which is raised.

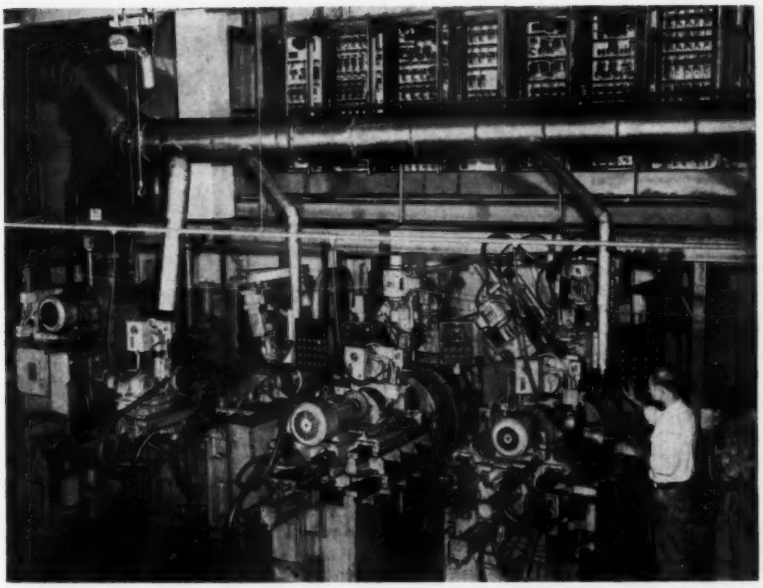


Fig. 3. The set-up man uses a sectional control pendant to test-run the section setting. Sections are electrically interlocked for full production runs.

systems however are mechanical, and the hydraulic pressure is used for clamping.

Where possible a lead-screw was used for feed and Reliance's V*S drive where variable speed was required. Hydraulic feed had been minimized because of variations in feed rate during the day due to viscosity changes as system and ambient temperatures rise.

One of the unusual features is the use of one lead screw for producing threads of different pitches. This is accomplished by bringing into effect changeable spindle gearing for the pitch desired. The lead screw is protected by being mounted on springs. Should trouble occur the lead screw nut backs off, trips a limit switch, and shuts off the power.

The shuttle beam which carries the parts into the machine, from station to station, and out again moves 54" with each stroke (the distance between stations). Three cradles for each station are positioned on the beam according to which of the three frame classes is being processed.

All of the component base castings are keyed vertically and horizontally to cast iron spacer blocks "grouted in."

The machine performance is controlled by an impressive console. Many lights are ready to warn of trouble from inadequate clamping, poor lubrication, or shorts in electric circuits. Not only can the console help the operator to minimize the expense which can come from electrical, hydraulic or mechanical failure but much time can be saved by the trouble being pinpointed on the console as to exact location.

At an initial cost of 25% less than the cost of a host of machines it is replacing, this machine is occupying only a fourth of their floor space. At an average of one completed frame a minute the Sundstrand machine is giving consistent quality and manufacturing economy.

end

ROUTER JIG HOLES MADE WITH RADIAL DRILLS IN PRODUCTION LINE SETUP

Positioning holes for router jigs of various sizes and shapes with varying number of holes are made at a production-line pace in this setup at one of the North American Aviation plants. Two Walker-Turner radial drills bring the drill or other tool to any spot on the work and position it accurately without a workholding device.

The operator of the first radial press (right) drills holes through a pattern that is positioned over the router jig by means of two pins on the jig. Router jigs are made up of an aluminum sheet cut to shape and backed up with ¾" plywood.

Holes in the patterns are ¼" dia. A special pilot attachment guides the drill into the pattern holes. It consists of a "spring cage," made up of two collars connected by bolts and springs, that holds a hollow locating pin through which the drill works. Locating pins are replaceable so that the entire pilot attachment need not be replaced when the pin wears.

After the first operator has finished drilling holes in a jig, he passes the work to the second machine. The operator of the second machine drills or countersinks the holes as necessary.

Heads of the radial drills can be extended 36" which permits drilling in very large router jigs. All router jigs at North American are made in this setup.

Ceramic Jigs:

NEW AID TO AUTOMATIC INDUCTION BRAZING

THE TREND TOWARD faster methods of fabrication to meet the demands of competition has not overlooked the general area of assembly techniques. Brazing, as a low-cost method of joining, offers excellent possibilities for further savings by using inexpensive wrought products joined together in a high speed brazing operation.

One of the most efficient ways to braze assemblies is through induction heat . . . utilizing an electromagnetic field to induce current, and thus heat, in the metal parts placed in its field. The method is rapid and accurate, often boosting production rates 100% to 300% over conventional hand-torch brazing methods.

The ability to accomplish anything with this method of heating often depends on the merits of the jig, due to the severe conditions associated with automatic brazing.

What is required of the jig for induction brazing?

1. It must be a non-conductor with good dielectric strength so as not to interfere with the inductive field.
2. It must resist flux penetration.
3. It must not warp over repeated cycles or oxidize at temperatures over 1200° F.
4. It must be able to withstand thermal shock, often quenching after the braze takes place.
5. It must not be "wet" by molten brazing alloys.
6. It must be hard and smooth, able to withstand wear over repeated cycles.
7. It must permit fabrication into complex shapes necessary to assure proper positioning.

What materials can meet these qualifications?

Metals are conductors and must be ruled out. Plastics will not withstand the operating temperatures. Mineral based insulators will often react with fluxes, and thus cannot be fabricated to the close tolerances necessary for automatic production.

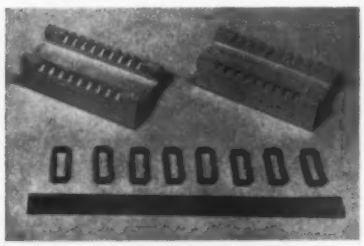


Fig. 1. Induction brazing jigs, of Sur-Braze M120-F fired ceramic, and the shaded-pole copper shunts which are brazed in them.

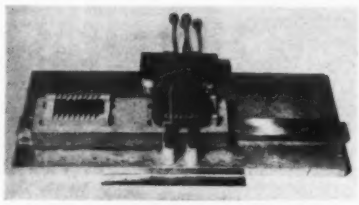


Fig. 2. Ceramic jigs are shown here mounted in two-place induction brazing fixture.

Ceramics offer an excellent solution to the problem of material selection for induction brazing jigs. Technion Design & Mfg. Co., Inc., recently announced a material — Sur-Braze M120-F ceramic — for this specific class of application.

This material, an aluminum-silicate, has a dielectric strength of 80 volts per mil in ¼" thickness. Its thermal expansion of 1.5 x 10^{-6} in/in/deg F and compressive strength of 40,000 psi (after firing), allow it to withstand severe thermal shock. It is non-oxidizing, and can hold size over many cycles. Technically vitreous, M120-F resists flux penetration, and can be machined easily prior to firing. After firing, it has a hardness comparable to tool steel. If close tolerances are required (closer than standard ±0.005" or ±1%), M120-F can be ground to ±0.0001". M120-F ceramic is available in a wide variety of stock shapes, as well as precision fabricated parts.

In one typical case, an electrical manufacturer wished to convert the brazing of shaded pole copper shunts from a slow hand torch operation to automatic induction heating. Copper shunts, because of their high conductivity and ability to dissipate heat, are difficult to braze by induction methods.

The heart of the solution to this problem was the Sur-Braze M120-F ceramic jig (Fig. 1) selected by Lepel High Frequency Laboratory engineers. The copper shunts are lined up in the ceramic jig, which in turn is loaded into the sliding two-place base (Fig. 2) and positioned under the induction coil. While the pieces at one end are being brazed, the jig at the other end of the base (Fig. 3) is being loaded.

Production was boosted from 300 pcs/hr to 950 pcs/hr — an increase of 316%.

The ceramic jig was used for the following reasons:

1. Its high dielectric strength assured concentration of the inductive field on the copper shunts being brazed.
2. Its low thermal conduction did not allow heat dissipation, thus permitting the copper shunts to reach brazing temperatures rapidly (in 32 sec).
3. It offered a stable non-warping surface, which allowed rapid alignment of the pieces in the jig for each cycle.
4. The ceramic was not "wet" by the overflow of the brazing alloy. Obviously, if the pieces welded themselves to the jig, the whole value of the automatic and accelerated operation would be lost.
5. The low thermal expansion of the ceramic was used to advantage; the copper shunts expanded at a faster rate than the ceramic, thereby closing the gap in the brazed joint to just the right distance (0.001 to 0.005" clearance) at 1200° F, the flow point of the brazing alloy.

Ceramic insulator jigs, therefore, offer new possibilities to the process engineers seeking to use induction heat for automatic brazing. They offer a stable product, as hard as tool steel, with high dielectric strength, permitting maximum utilization of this efficient method of joining metals. end

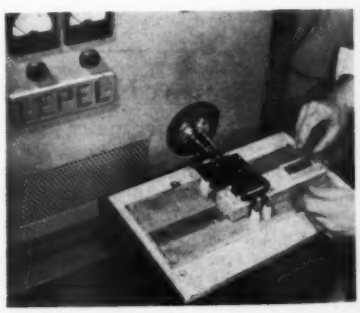
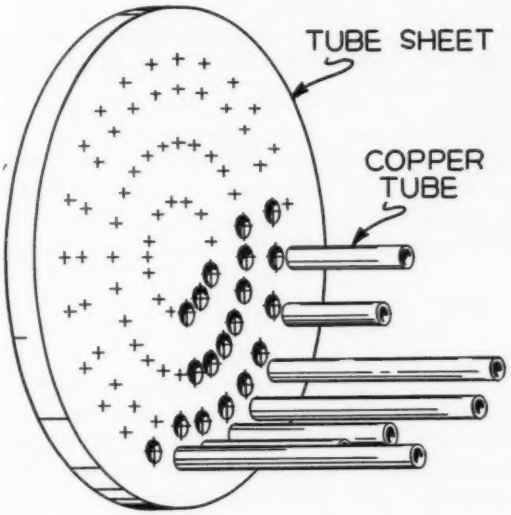


Fig. 3. Shunts in the one jig are being brazed while the operator loads the next group. The jig base is then slid along the guide-bar until the second group of shunts is within the induction field. Note that this permits the induction coils to be wrapped very closely around the workpieces.

COOLANT INDUCTOR BUSHING LICKS TOUGH DRILLING JOBS



by C. B. Weidner
Tool Engineer
AIR PRODUCTS, INC.
Emmaus, Pa.

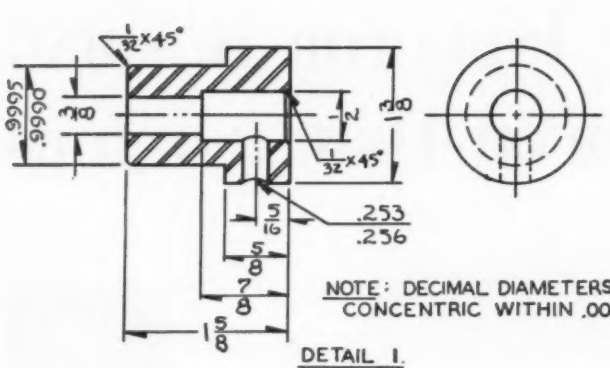
When we first received Mr. Weidner's article we were inclined to shed tears for any poor souls who have to drill deep holes in copper. After fully digesting his experiences, we rushed his story into print for your amazement and enlightenment. As far as we are concerned, a tube sheet having as many as 11,000 holes of 0.228" dia. drilled on 0.34375" centers is about the last word in proving grounds for hole drilling techniques. After drilling the 10,999th hole one should have a masterful knowledge of drills and drilling. Mr. Weidner has, and here it is.

ONE OF THE MOST vexing problems encountered in our operations is the drilling of copper, and is due to the inherent abrasive action of the copper on the drill.

The problem was greatly magnified some months ago when an automatic machine was developed for the drilling of tube sheets. My original setup utilized gun drilling. This, while extremely accurate and fairly fast, posed two problems. The first was the high cost of gun drills. The second was occasioned by sharpening methods. We have the average toolroom equipment for carbide grinding. The resharpening procedures caused a slight variance in drill points. Since the gun drilling process is difficult to apply to soft ductile materials such as de-oxidized copper, the minute point variations caused drill life to fluctuate sharply.

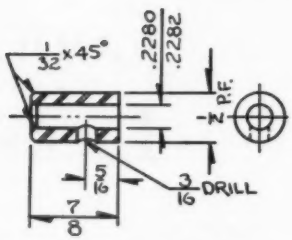
Our automatic tube sheet drilling machine is designed to operate without any operator attention once it is started on pattern. The point life fluctuation made this feature a practical impossibility. Point life varied anywhere from 20 holes per grind to 1,000 holes per grind. The drill breakage which occurred occasioned a large expenditure for drills. We were squarely faced with the problem of adding costly grinding facilities and inspection facilities to our toolroom. All this equipment — just to produce ultra-precision points on our gun drills.

Desperation caused me to turn to the common twist drill, carbide tipped. The drilling job itself was somewhat unorthodox, to say the least. We had to drill through a tube sheet of a thickness 6½ times the drill diameter without a retract for chip relief. Such penetration was



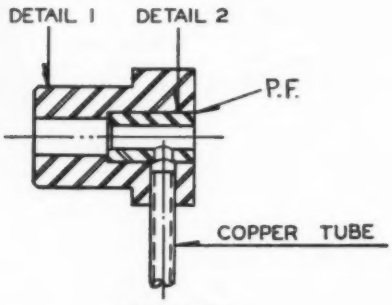
NOTE: DECIMAL DIAMETERS CONCENTRIC WITHIN .0005 T.I.R.

DETAIL 1.



NOTE: I.D. AND O.D. CONCENTRIC WITHIN .0005 T.I.R.

DETAIL 2.



ASSEMBLY

possible only by accurate feed control. The real bug-a-boo was again drill life. Tube sheet drilling by automatic means came to a rather screeching halt.

Every problem has an answer. The real problem is finding this answer. I contacted the carbide representative and laid my abrasion problem in his lap. I asked for drill tip blanks of grades 905 and 999. It seemed that grade 883 was not giving me sufficient abrasion resistance. I was informed that such blanks were "specials" and would take some appreciable time. I asked that all possible haste be employed and resigned myself to the inevitable waiting.

Production commitments forced action long before any special blanks could be obtained. Faced with the need for producing tube sheets on our automatic machine, I sat down and carefully analyzed the problem. I felt sure I was using the proper coolant. The flow of coolant was quite sufficient. There remained only one question. Was I getting the coolant to the required point? The answer seemed quite obvious. No.

One way to be sure was to push the coolant down through the drill. Drill companies informed me that in 7/32" drills, it was practically impossible to produce oil hole drills with a tungsten carbide tip. After a great deal of head scratching, I produced an experimental drill bushing of the type depicted by the accompanying drawing.

The theory behind this bushing is simple. An induction hole is located so as to supply coolant under pressure to the drill flute cavities. The induction hole is located one-third of the bushing length from the end of the bushing which contacts the work. The bushing as used in our automatic tube sheet drilling machine is used head down as all drilling is done vertically. It advances at each hole position to contact the surface of the tube sheet.

The flow orifice into the bushing chamber must be large enough to supply more coolant than can flow down and up the flow orifice represented by the drill flute. The coolant pressure in our case is 100 psig. The bushing illustrated is in two parts. One is a headed housing to which the copper coolant tube is silver brazed. The second part is a simple headless press type bushing with a metering hole through one side. The latter is pressed into the first so as to have the two holes in alignment.

The results achieved by this bushing are next to unbelievable, viz:

Drill diameter: 7/32"
Drill type: Standard twist drill with grade 883 carbide tip brazed in place
Drill speed: 3000 rpm
Drill feed: .0015" per revolution
Coolant pressure: 100 psig

Under the above conditions 3000 holes were drilled. This represented approximately 4200" of hole length in de-oxdized copper. The drill was still cutting well but there was a slight amount of wear on the outer corner of the drill. Size was exact. Hole finish was fully equal to that of gun drilling. To date, the lowest number of holes on any one sharpening has been

2500 before wear became evident. The inserted bushing has served 10,000 holes to date and has shown a wear of 0.0002". These results prove that too often we blame drill and drill material when we should examine the coolant application.

Editor's note: In the course of working with Mr. Weidner on this article, we questioned him as to the coolant actually getting to the drill point because of there being a "pocket" of coolant at 100 psig under the coolant induction hole—a sort of "dead end". He said:

"I do feel that coolant is reaching the drill point. It very probably is not at 100 psig. Frictional resistance, even though low, must reduce it below that value. To support my statement there is only the circumstantial evidence of such greatly increased point life of the drill.

"There is, however, another point which is evident from observation. Where the drill breaks through, a high velocity stream of coolant flies out of the workpiece hole.

"These two facts lead me to believe that the conditions are as I state. I feel that the main increase in point life is due not to greater heat transfer to the coolant so much as to vastly improved lubrication between the drill and the copper.

"To me, the proof of the pudding is in the drilling of copper. People not confronted with the drilling of many holes in de-oxidized copper cannot appreciate the tremendous problem of abrasion."

We also asked him about earlier experiments, guarding against coolant and chips, and the determination of the location of the inductor hole. His several comments follow:

"In a year's time we drill hundreds of thousands of these tube sheet holes. One of our vendors approached the abrasion problem in the following manner. They found that drills used in copper wear along the margin on the forward portion of the drill. This wear can extend back from the lip as much as ¼", and can amount to a few tenths or a few thousandths, depending upon how long the drill was run. Before resharpening a drill a ½" length was cut off. This method reduced drill breakage to a minimum. It was to obtain increased wear life that we changed to carbide tipped drills which gave us more holes per grind.

* * * *

"I would like to state that no oil squirts out between the tube sheet and the bushing head. The oil that flies is flung out by the rotation of the drill, its adaptor and the spindle. Splash guards are most necessary because the oil really flies! I might add that the chips are flung out in a like manner.

"As to the resistance of the drill flutes to oil passing down them. When any flute is coincident with the induction hole, the back-pressure exerted by the pumping action of the spiral flute is low relative to input pressure. When the pressure is off, after the flute has passed the induction hole, the spiral's pumping effort actually enhances the chip scavenging.

* * * *

"Locating the induction hole closer to the work end of the bushing is something I arrived at by trial and error. In my experience this location has produced the best scavenging action. The ejected chips gain the most velocity with the induction hole at this point. The bushing referred to is the inner bushing.

* * * *

"Let me again say I cannot prove any of this theory. This reasoning led me to make the first bushing. I have made quite a few more. They all work so I can conjecture that they work for the reasons I have stated. Maybe someone else can propound a different set of reasons. I sincerely feel that anyone having similar problems will find the time and money well spent to explore this method."

Further, Mr. Weidner sent us three additional sets of performance data shown in the accompanying table. These involved using his coolant inductor bushing and HSS drills without carbide tips.—E. W. P., Editor. end

Case I
Drill dia: 15/32, HSS, no carbide tip
RPM: 960
Feed: 0.003" per rev
(Recommended rpm: 870)
Material: .30 carbon steel, ¾" thick
700 holes with practically no drill wear*

Case II
Drill dia: 17/32", HSS, no carbide tip
RPM: 960
Feed: 0.002" per rev
(Recomended rpm: 800)
Material: .30 carbon steel, ¾" thick
540 holes with practically no drill wear*

Case III
Drill dia: 15/32", HSS, no carbide tip
RPM: 1600
Feed: 0.004" per rev
Material: 3S Aluminum, 1¾" thick
600 holes — no wear — no chip weld*
*All of the above holes drilled in one pass — no retract for chip clearance — no chip problems.

Comparison: AUTOMATED AND CONVENTIONAL SYSTEMS

by James R. Bright
Associate Professor
Graduate School of Business Administration
HARVARD UNIVERSITY

CAPITAL COST OF AUTOMATION

Tending to raise the cost of automation as contrasted to an equivalent "conventional" production system are these factors:

1. Larger amounts of machinery because of mechanization of more functions and on a superior scale of speed, quality of output, etc.
2. Greater complexity of machinery.
3. Higher percentage of control devices.
4. Higher proportion of novel elements requiring more engineering-development work.
5. More testing and rebuilding expense in development.
6. Larger and more difficult installation job.
7. Difficulties encountered because stranger firms must integrate their physical systems and diverse technical arts.
8. Longer debugging time.
9. More scrap and lost production during the trouble-shooting period.
10. Need for extra production facilities while defects are corrected.
11. Cost of correcting mistakes made in an over-hasty program.

Tending to lower the cost differential:

1. Less volume of machinery, due to
   - compounding of more functions on fewer machine bases
   - higher production obtainable from smaller but faster machines
   - higher machine utilization and efficiency brought about by mechanical work-feeding and interlocking control.
2. Less building space and facilities due to
   - less volume of machinery
   - reduced in-process storage space and storage equipment requirements
   - less space required for operators
   - fewer traffic aisles required since the material is mechanically moved within the production machine.
3. Extent to which the "conventional" system is already highly automatic.
4. Extent to which the automatic system has been perfected by prior installations.

See TOOLING & PRODUCTION, Oct. '56, p. 8; Mar. '57, p. 93 for additional articles on Automation by James R. Bright.

MAINTENANCE PROBLEMS

Tending to increase maintenance:

1. Increased mechanization across the span of the production system.
2. Higher proportion of moving parts.
3. Greater complexity of the machinery.
4. Greater complexity of the controls.
5. More novelty, uniqueness, or degree of innovation present in the mechanism.
6. Increased extent to which the machinery employs new technologies.
7. Higher proportions of electro-hydraulic-pneumatic actuation of controls and machinery as opposed to mechanical linkage.
8. Increased extent to which the machinery operates near design limits of speed, temperature, precision, capacity.

Tending to decrease maintenance:

1. Reduction in total amount of machinery through smaller size of plant and compounding of production equipment.
2. The extent to which the automation reflects a substantial shift from old, worn equipment to new equipment.
3. More design and engineering experience with automated machinery concept.
4. More operating and maintenance experience with the automated machinery.
5. Increased proportions of "standard" components in the automatic machinery.
6. Adoption of a better preventive maintenance program in the new plant.
7. Mechanization of trouble prevention and use of trouble signalling systems that forestall serious failure and damage.
8. Mechanization of portions of maintenance job, such as automatic lubrication.
9. Techniques that speed the maintenance man's comprehension of the control system, such as color coding of circuits.
10. Constructions that facilitate rapid removal and replacement of parts and assemblies, or that permit easy observation of the functioning and actual use.
11. More effective organization of the maintenance activity.

The net impact on maintenance in a given plant is a blend of the effects of these factors.

end

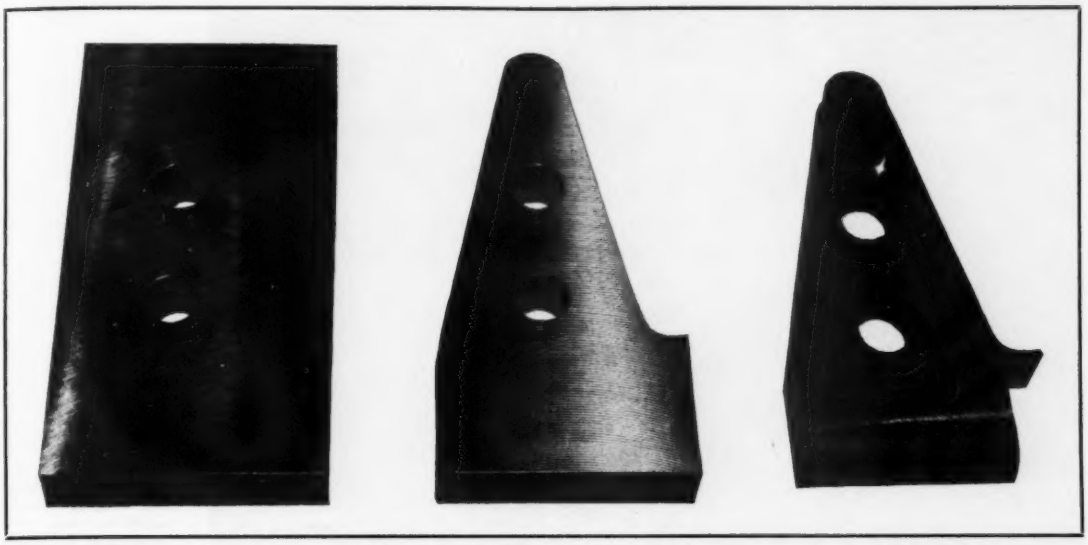


Fig. 1. Titanium engine mount support for a Convair fighter, shown at three major machining stages.

A Case History in

PRODUCTION MACHINING TITANIUM

by W. L. Carr
Assistant Foreman
CONVAIR — SAN DIEGO
A Division of
General Dynamics Corp.

ALTHOUGH IT IS STILL quite rightly regarded as a problem metal in many industrial circles, titanium is to Convair-San Diego's production machinists "just another material" at present. It has its peculiarities, to be sure, but they are creating no more difficulties than the eccentricities of stainless steel.

This is attributable in part to metallurgical improvements that have recently been made in titanium and its alloys, not to mention the fact the latter are now available in many readily-machined sizes and types of bar stock. But most important is our status as one of the oldest titanium fabricators, since there is still no substitute for practical experience in any field.

If asked to explain the processing distinctions of titanium as compared with other metals, one of our production machinists would probably say you just need exceptionally rigid

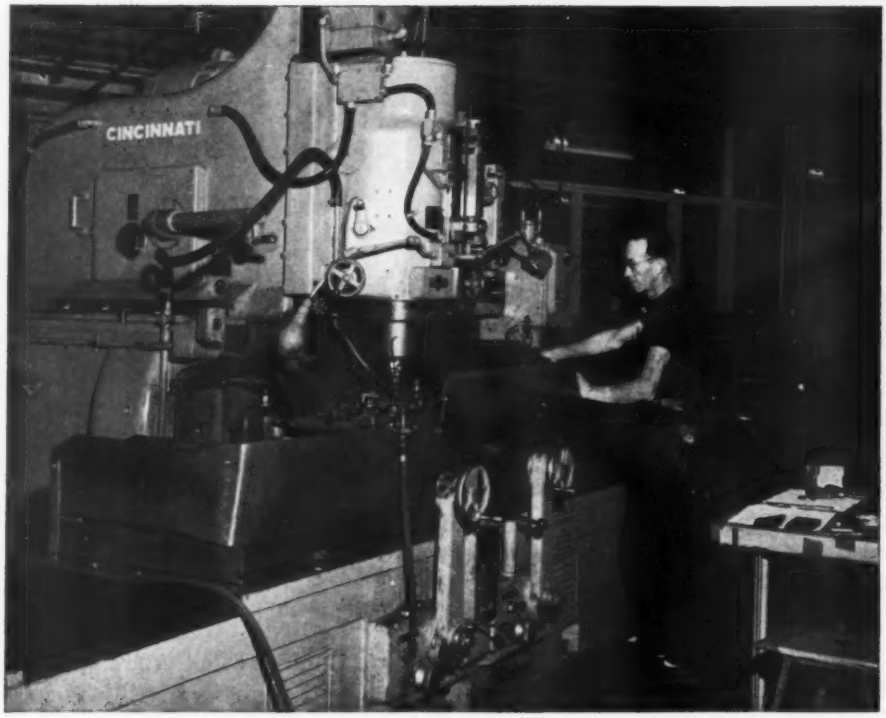


Fig. 2. Several operations on titanium engine mount supports are performed on this Cincinnati Hydrotel vertical-spindle profiler.

setups and constantly-sharp cutting tools. However, there are more subtle differences which can best be understood if the procedures used in making one relatively complicated part are examined.

Such a part is an engine mount support now being produced for Convair's new delta-wing fighting planes. It is machined from 0.75″ x 2.5″ x 4.8″ bars comprising the AMS 4925 alloy.

Bars with the specified 4.8″ length are obtained by cutting standard stock with an 8 x $\frac{3}{16}$ M3, Type 2 high speed steel mill saw. The latter has 36 teeth, is operated at 50 sfpm carrying 0.0025 ipt, and uses a cutting fluid comprising two parts sulfur oil and one part kerosene. It can cut a 0.75″-thick bar in one pass; 60 pieces are obtained with each cutter grind.

The titanium bars are next machined to length for locating purposes, and brought to a 0.620″ thickness. In this connection, it was for

Fig. 3. Close-up of milling setup used to profile outside perimeters on the Convair part shown in Figure 1.

Fig. 4. Close-up view of milling setup used to produce pocket in titanium engine mount supports.

some time found difficult to remove enough material by means of face mills with teeth of either high speed steel or carbide. But now good results are being obtained with high speed steel shell mills where each cutter has around 10° positive radial and axial rake; also with carbide face mills where each cutter has a neutral radial and axial rake. Carbide cutters are of the straight tungsten carbide grade, since titanium carbide types tend to fuse or weld themselves to the workpieces. Best results are obtained with either carbide or steel cutters if teeth have a 45° chamfer slightly larger than the depth of cut.

Two 0.50″-dia tooling holes are subsequently made to facilitate the task of positioning each part on a profile fixture, which is used to machine the inner and outer contours of the specified support. These holes have been satisfactorily made with standard high speed steel twist drills, but experience has shown that cobalt drills are preferable because their heat resistance makes them longer-lived. A 45° x 0.03 chamfer has been used on the outer corners and lips of both steel and cobalt drills for the purpose of increasing their longevity by distributing heat over relatively large tool areas; and where this was done, an included point angle of 135° with a split point made up the remaining drill geometry.

Perhaps it should be noted here that drill modifications indicated in the latter statement are considered non-essential where tool diameters are ⅜″ or less.

A tracing pattern is next used on a No. 4 Cincinnati vertical Hydrotel machine to profile the outside perimeter and the inside pocket on each titanium support. The external operation involves rough cutting with a three-flute high speed steel end mill of ¾″ dia, and finish cutting with a similar tool of ½″ dia. All internal cutting is done with a two-flute, fast-spiral ½″-dia end mill with polished flutes.

Without exception, the cutters used in profiling are run at about 500 sfpm with a feed rate of 0.003 to 0.005 and a water-soluble coolant.

Profiled parts are taken to a horizontal mill, where each is machined for a 0.310″ edge radius on one end and then gang milled on the opposite end. Here it is necessary to use straight-tooth side mill cutters where remaining wall thicknesses are less than 0.3750″. If a staggered tooth cutter were used (in connection with this or comparable gang, slotting, or straddle mill operations), a rough finish would be obtained and close tolerances would be hard to hold; for due to the toughness of titanium and the cutting action that would be performed by every other cutter tooth, the material would spring in and out — thus producing considerable chatter.

In the next and final machining operation, the titanium supports are redrilled so that their respective 0.50″-dia tooling holes will be opened to 0.69″ and 1.13″ diameters. Purpose of this is to minimize the weight of the parts.

end

POWER GRINDING

THE ABRASIVE INDUSTRY has been continually developing grinding wheels for heavier stock removal. To go along with these more stable wheels, the Mattison Machine Works recently unveiled their newest "Plano" grinder.

Hitherto unassociated with grinding, tremendous power and capacity for handling large jobs in one setup are demonstrated in this machine.

When grinding, it is important, especially with rough stock, to get below the scale and surface impurities before wheel glazing* takes place; glazing requires undue wheel dressing and early disposal. Then, with more power behind each grain of the wheel, and with each grain taking a clean bite (rather than rubbing off) a self-dressing action is maintained for continued free cutting.

With its tremendous power, this "Plano" surface grinder can plunge-grind below the scale of steel or cast iron and yet only remove enough metal to clean up. In other more conventional cleanup methods that involve chip removal, a greater depth of penetration is necessary in order to get far enough below the scale to start a chip rolling. The savings in scrap alone is a big advantage and other more important economies can be realized from a decrease in handling and setup time.

In *one* setup, a finish of 2 - 4 rms can be had by changing wheels or 10 rms can be realized with *one* wheel starting from a rough casting or a mill-finish plate. In keeping with this finish, flatness was found to be better than 0.0004" for a surface the size of the machine table, and dimensional control within 0.0002" is possible.

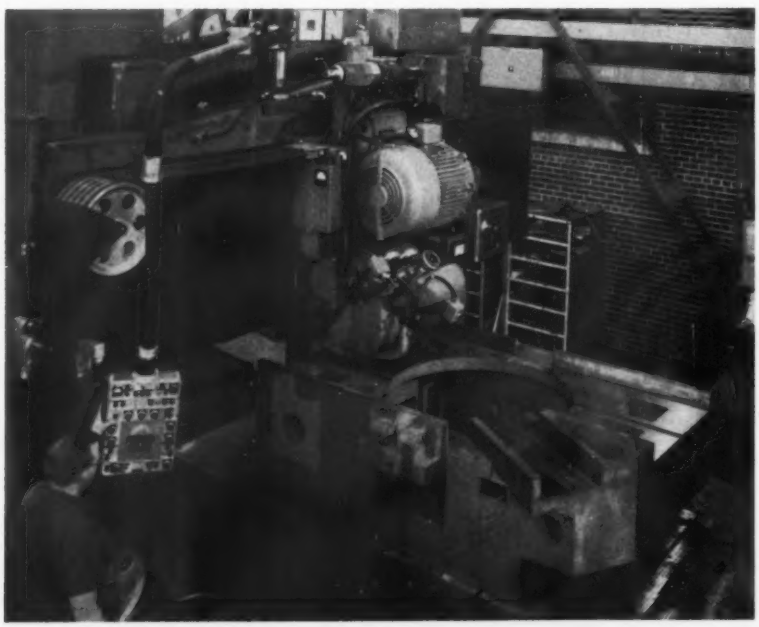
Even with the machine bulk what it is, 184,000 lbs, the feed can be controlled to within 0.0002" in any direction. This extreme accuracy (extreme for any machine, let alone one of these proportions) is due in part to the fact that all component castings are stable, having been made of Meehanite from Mattison's own foundry.

In the picture the grinding of a complete machine base is shown. What is being accomplished here in a matter of a few hours (with 75 hp) would take 20 or 30 times this to do by more conventional methods. The resharpening of large aircraft dies can be done easily on this machine, as well as the grinding of large die plates and machine tool ways.

As can be seen little consideration was given to streamlining, but every other feature of good design and workability was considered and reconsidered in the two years building time. All in all, over 8000 engineering hours were consumed in the design of this titan from Mattison's "Hall of Titans."

This machine with a horizontal spindle can be furnished either as shown or with a vertical tiltable spindle (with 60 hp max) or the two spindles can be mounted on the same cross rail and used simultaneously for grinding a flat way and a vee way in the same setup.

*Glazing of a grinding wheel causes smearing and polishing which tends to follow the irregularities of the existing surface making it impossible to obtain a flat surface. The principle behind the "Plano" grinder is to furnish enough power and rigidity in order that the feed can be deep enough to obtain a cutting finish.



Should the desire be to grind multiple pieces with a vertical spindle, the increased horsepower makes it less necessary to tilt the spindle — more horsepower enables the wheel to run flat, having each grain on its face backed with sufficient push to make a clean cut. A dead-flat wheel is bound to produce a flatness which would be impossible to achieve otherwise.

The table shown will accommodate an 80" wide workpiece on a 12' bed. The distance between the table and the largest diameter wheel (24") is 25". Larger sizes are in production which will increase the distance between the wheel and the table to 60", and tables up to 30' long are in the offing. The wheel seen on the machine has a face width of 6".

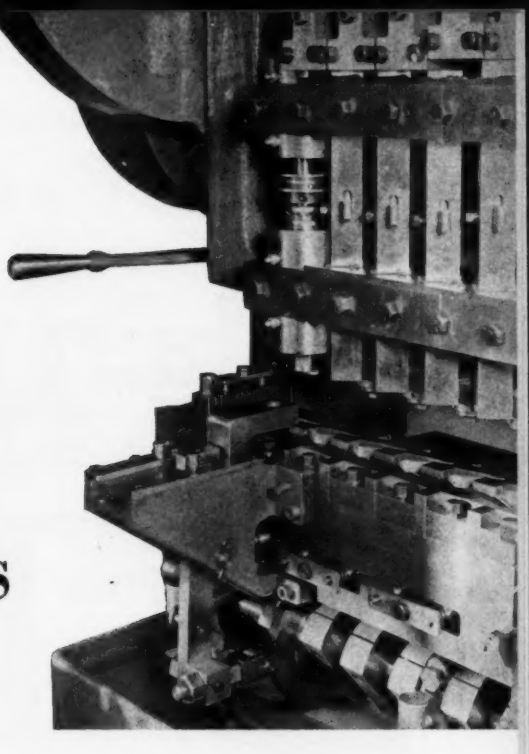
At the pendant, the operator can set all stops (except the table travel stops which must be set at either end of the machine), select all feeds and speeds, and start and stop all automatic operation. As well as being completely automatic, every motion of the machine can be also operated manually.

An interesting feature of all Mattison machines is an ammeter which is an aid to the operator to help him keep the machine grinding to capacity and grinding safely. The ammeter dial reads in percentages up to 100 in black and has a red danger zone. In startup the operator increases his feed until the ammeter indicator hand reads near 100%. He knows then that the motor is operating at capacity but not overloaded. With the proper wheel he also knows that it will not break down prematurely. Without the meter the operator has no reliable check on the effectiveness of his selected speed and feed. This would be especially important in the grinding of unknown materials, for which no recommendations or experience can be drawn upon.

The base of the machine is free from any of the usual operating controls, hydraulic equipment, lubrication apparatus (lubrication begins automatically with any motion of the machine) or other components. For this reason the maintenance of the remotely placed service equipment is easy and the machine base can be placed below floor level if desired.

An increasing demand for greater accuracy from machine tool builders' products means more built-in wear resistance. To increase a machine's resistance to wear, machine tool builders have been turning to flame hardening. These grinders with their increased capacity and power should shoulder their responsibility well and be kept busy since the only logical method of working a hardened surface is by grinding. This is especially so since finish and flatness compare favorably to hand scraping.

end



THE TRANSFER PRESS
. . . an Automatic Factory

by Ernest J. Urbas
Superintendent — Tool & Die Dept.
THE GUARANTEE SPECIALTY MFG. CO.
Cleveland, Ohio

THE INDIVIDUAL WHO COINED the word "automation" must have been standing in the shadow of a transfer press, when the word took shape in his mind. It can truly be said that the transfer press is an automatic factory, complete in itself.

This type press, if properly equipped, can straighten, oil and feed the material (whether it be strip or developed blanks), cut up the scrap, and process the workpiece through a multitude of operations by a series of mechanical movements — all this being repeated with each stroke of the press, all this being performed automatically.

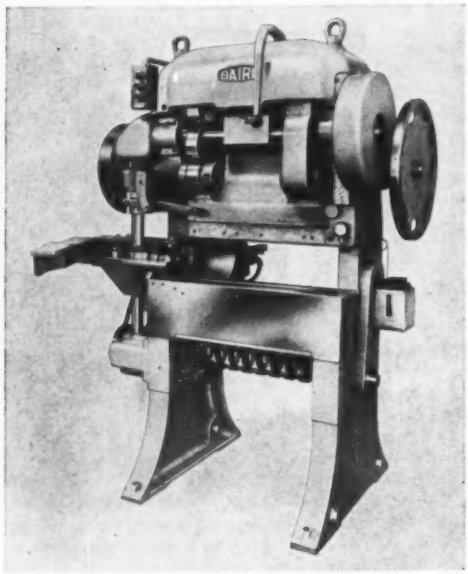
If you ever had the pleasure of witnessing a transfer press in action, you most probably observed a hundred or more synchronized mechanical movements all timed to occur at precise points of the crank cycle. This mechanical motion would be operating so smoothly you hardly realized there were that many movements taking place. Sometimes these movements are so close to one another that they seem to overlap but these movements, once established and set, continue to perform their function over and over at precisely the right instant.

The type of stampings produced on a transfer press are usually drawn shapes either simple in design or of such extreme design that generally they can be produced practically only in a

The title photo at upper right is a close-up of a Waterbury-Farrel cam eyelet machine, direct descendant of the "grand-daddy" of them all. This class machine, and a forerunner of modern automation, was conceived long before the turn of the century. It features, as do all transfer-type presses, straight-line indexing of individual workpieces from station to station.

Courtesy, Advance Stamping Co.

TRANSFER PRESS
CASE HISTORY NO. 1



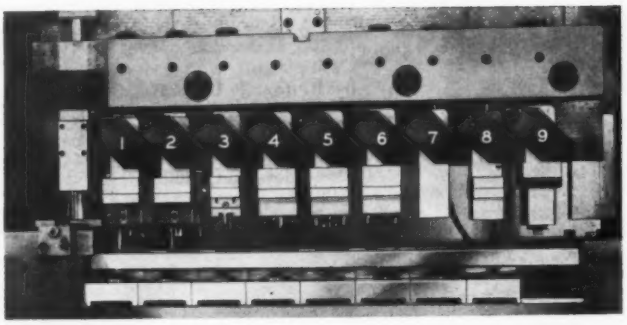
Oven Switch Back Plates

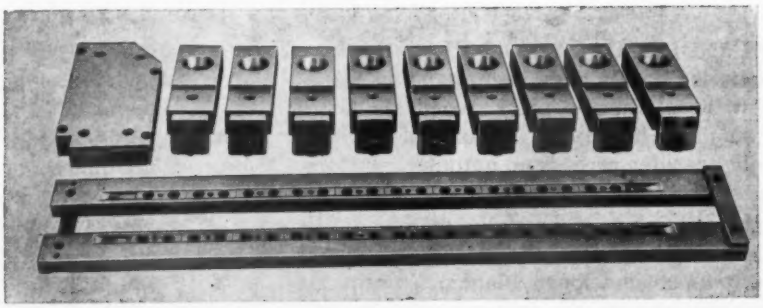
A standard type of transfer die set is used in this automatic multiple transfer press. Such interchangeable die sets can be left permanently tooled, thereby reducing the setup time to a matter of minutes whenever a complete change-over of jobs is made. Use of insert tooling facilitates minor station changes or tool servicing.

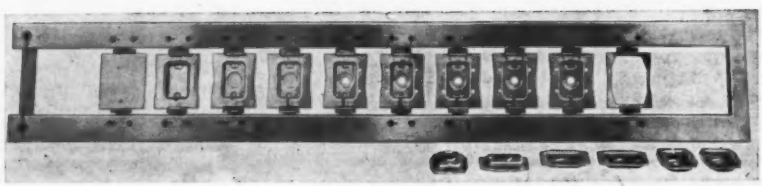
This type of press is ideal for high production of non-concentric small parts, with blanks cut from strip stock fed from coil at back of press.

Tooling shown in the close-up is for the back plate of an oven switch, produced at the rate of 60 pcs/min. With the new type of transfer slide and tapered spring-loaded fingers used, the blank is picked up directly at the blanking station. Usual practice has been to advance the blank from the first station by means of a separate slide.

Courtesy, The Baird Machine Co.







transfer press. If produced in other type presses, such stampings would require operations on a succession of presses before they are completed. This is especially true with those stampings that require work on the edge after the part is trimmed. This, then, is the most important feature of a transfer press — that it can produce deep drawn stampings of such unique design that no other press, but a transfer press, can produce the part complete automatically.

This is no new concept of stamping; this type of press has been used for many, many years in the mass production of stampings. The original machines, small in size, found their place in industries that required miniature drawn shapes. Highly specialized industries used this press as their stock in trade, in the manufacture of such items as eyelets and tubular rivets — miniature parts that are produced in voluminous quantities. Although the transfer press was first introduced before the turn of the century, it wasn't until recent years that it was developed to successfully produce non-concentric parts. From this point on, the transfer press moved rapidly into the limelight as the best and only means to produce some types of stampings complete in one machine.

With labor and material costs ever on the rise, the trend will be to produce more and more stampings by the transfer method. Further stimulus to this method of operation has occurred through the vast demand for modern and necessary conveniences. The transfer press is no longer limited to the fabrication of miniature parts; today, gigantic transfer presses produce extremely large stampings.

The transfer presses are sometimes called by a variety of names which tends to confuse the uninitiated. Presses in this family travel under such names as eyelet, multiple plunger, cam eyelet, cam plunger, cam roller eyelet, stepped die press or under newly coined words such as "Transmat" or "Transflex". Such names might be descriptive of mechanical action, but nevertheless the presses to which they apply are all *transfer* presses.

The transfer press, as the name implies, embodies a series of individual press dies that are mounted in a special type of press equipped with a mechanism that transfers the workpiece from station to station, progressively throughout all the stations or operations.

The tools resemble conventional type dies. However, the lower die halves are all built to exact parallel heights, while the widths of the dies (left to right) are made to exact dimensions so that — when these tools are all mounted on a common bolster — they are

Courtesy, Carol Machine Tool Co.

Fig. 1. Typical deep drawn stamping which can be produced simply in a transfer press.

packaged or butted against one another to provide a smooth table-top surface for the advancement or transfer of the workpiece by the transfer arrangement. The widths of the dies are governed by the distance from center to center of the multiple plungers in eyelet machines, or the center-to-center distance of the punch holding settings of two-point suspension type presses. These distances are exactly the same as the distance of travel of the transfer mechanism.

Naturally, the feed or transfer mechanism must grasp the workpiece in each station and transfer it to the next station. This is a fixed

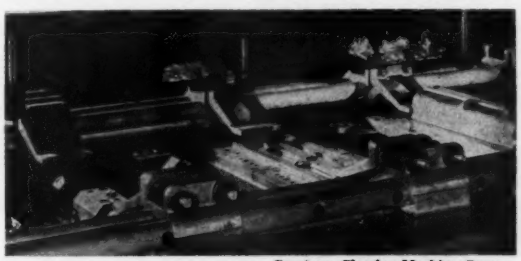
Courtesy, Carol Machine Tool Co.

Fig. 2. Operational sequence of two thermostat components produced on transfer presses. Notice the side and angular pierce operations that can be accomplished by ingenious tooling. At the right is the assembly that incorporates the two stampings.

distance of travel and is unvarying in each machine's transfer mechanism. (Recent model presses have appeared that have greater flexibility). Consequently, the tools made for one type and size of machine will not fit into another unless the style and size are identical.

SELECTION OF STOCK FEED METHOD

Various methods are used to feed the raw material to these machines. The raw material may be in the form of coil stock, developed blanks, or pre-drawn cups. Roll feeds, belt feed, stack feeds, gravity feeds, slide feeds, hoppers, or friction dial feeds are all methods



Courtesy, Clearing Machine Corp.

Fig. 3. The feed fingers are made to suit the piece part (in this case, valve covers) and are mounted to holders that are readily adjusted along the length of parallel feed bars to facilitate setup. Station tooling incorporates positive locators.

TRANSFER PRESS
CASE HISTORY NO. 2

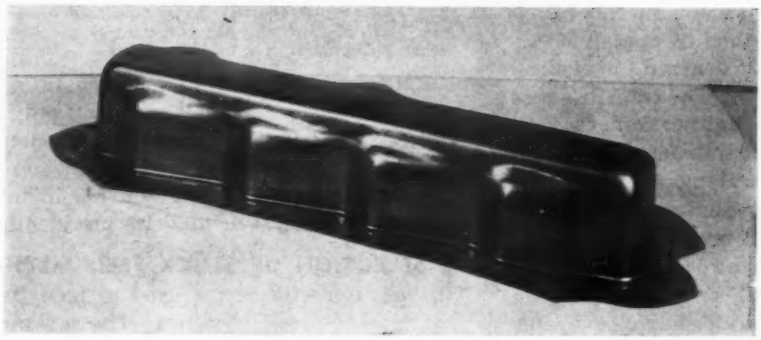
Valve Covers

Adjustable pitch distance is a feature of such presses as this 600-ton Transflex tooled up for producing valve covers from 18½ gauge material in just four operations—cut-off and draw, strike, pierce and trim, and curl.

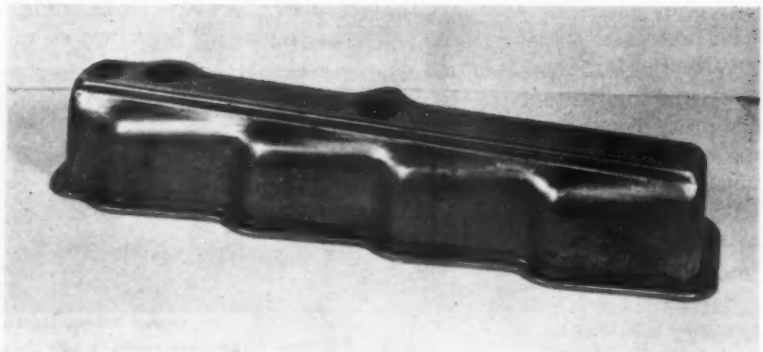
The versatile transfer feed arrangement permits the press to be used with 12-station tooling and 10" pitch, or 4-station tooling and 30" pitch, or any number of stations between these extremes.

The die cushions are moved by a screw mechanism to serve any station that requires hold-down or lifting pressure. The knock-out mechanism can be employed anywhere along the full length of the slide. These features are desirable for use of the press on a variety of part sizes and shapes.

Courtesy, Clearing Machine Corp.



No. 1
Cutoff and Draw



No. 4
Curl

used to move the raw material to the machine. The selection of the method to suit a particular job is usually based on the most economical use of the equipment, shape of the part, the number of pieces to be produced, and the speed in which they must be produced.

The determining factor is the number of operations to be performed. Only as many operations can be performed as there are punch holder settings, or plungers in which the punches are mounted or secured. If there are not enough punch holder settings available to complete the particular operational requirements, you can either perform certain operations before the transfer press operations or perform secondary operations after the parts come off the transfer press, or both before and after.

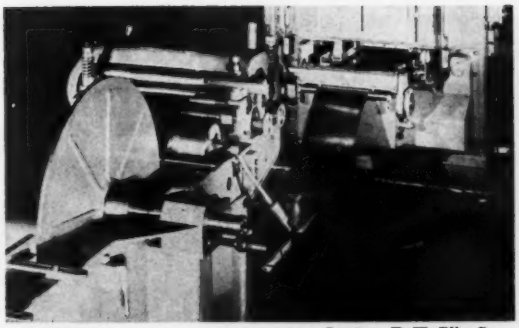
Another factor is the number of pieces to be produced. You can see that, if the transfer press produces the parts fast enough to exceed the demand, it might be desirable to include the blanking operation in the press.

Usually, the mass production of large stampings requires that developed blanks be fabricated on a press independent of the transfer press. The reason is that generally the blanks are simple in design, which permits the building of a trouble-free "drop through" die that produces the blanks in multiples — more than one with each stroke of the press. When blanking in multiples, the stock strip layout permits more economical use of the material. The tremendous savings that result by the use of the multiple layout more than offsets the cost of the preliminary blanking operation.

The paramount reason for feeding *blanks* to the transfer press is that maximum productivity is achieved. It can be observed that, when blanks are fed to the transfer press, it is possible to engage the transfer press stroke in full automatic operation and never stop it during the full course of a day's operation. Consequently, an amazing record of pieces can be produced.

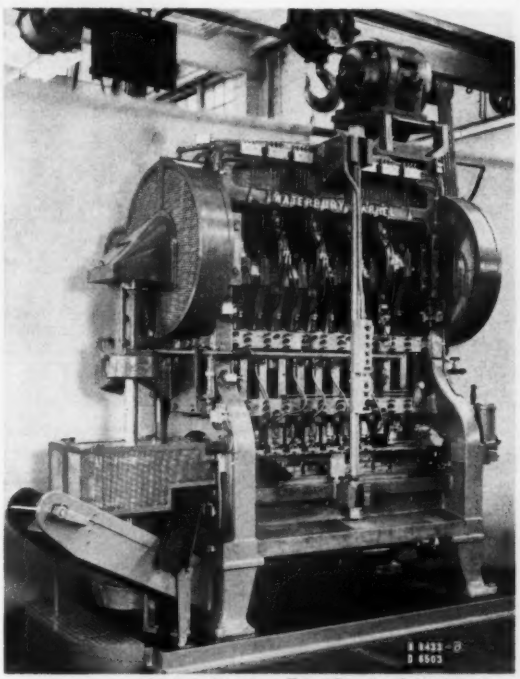
Another instance where developed blanks would be made in an independent press would be where the blank is so large and heavy in thickness as to require a tonnage requirement far in excess of the capacity of a particular transfer press. Thus, smaller transfer presses often can be used because of the elimination of the high tonnage requirement for blanking.

If you elect to feed blanks to the transfer press, you might consider the purchase of these blanks from the mills that specialize in this type of work. These mills have the capacity to use extremely wide coil stock and are capable of handling the large coils and the tremendous amount of scrap that results from high speed blanking. If you purchase these blanks, you work with clean material ready for consumption on the press. In addition, you pay cartage charges on only that material used in the piece part instead of freight charges on material of which a large amount ends in scrap. Furthermore, the equipment to produce the developed blanks, to handle the material, or to bale the scrap may not be available in your shop.



Courtesy, E. W. Bliss Co.

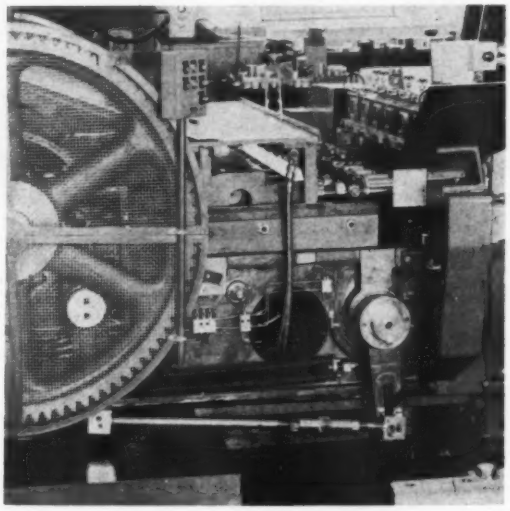
Fig. 4. Where coil stock is used on smaller transfer presses, the strip is usually fed at right angles to the line of work progression through the press. On a larger press, such as shown here, the strip is fed into the end of the press for cutoff in the first station. Ordinarily, a second roll is held in readiness to be swung into the coil cradle with minimum time lost for change of coils.



Courtesy, Waterbury Farrel Foundry & Machine Co.

Fig. 5. From the beginning strip through the multiple operations to the finished part, the work in this multiple plunger pillar press is under precision control. A finger, used in conjunction with the feed roll when blanking more than one row in a strip, assures proper interlaying of the holes and prevention of incomplete blanks.

TRANSFER PRESS
CASE HISTORY NO. 3



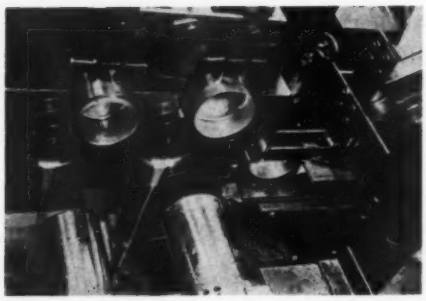
Flash Light Cases

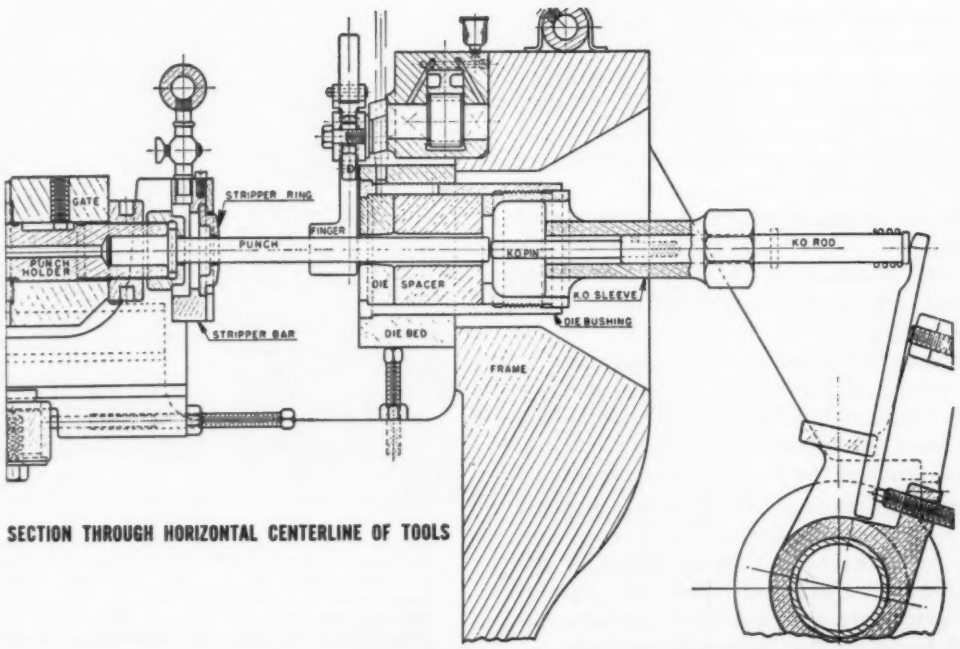
Where requirements call for shells longer than can be accommodated in most eyelet presses, horizontal redraw presses are often used.

Continuous drawing through a number of stations permits deeper draws without annealing, for the heat produced by working the metal is retained within the shell and not lost as would be the case in conventional press work.

Cups are produced in a separate press and fed to these presses from a feed chute (upper right in close-up view). Transfer fingers are shown in act of advancing workpieces.

Courtesy, The Waterbury Farrel Foundry & Machine Co.





SECTION THROUGH HORIZONTAL CENTERLINE OF TOOLS

METHODS OF TRANSFER PRACTICE

The actual feeding of these pre-cut blanks is accomplished in one manner, by a completely automated feed system which is fastened on either the right or the left side of the transfer press frame. This mechanism is called a "stack feed", for stacks of blanks are hand loaded into nests which are provided on a rotary or turret table. This turret table indexes these nests directly under the feeding magazine.

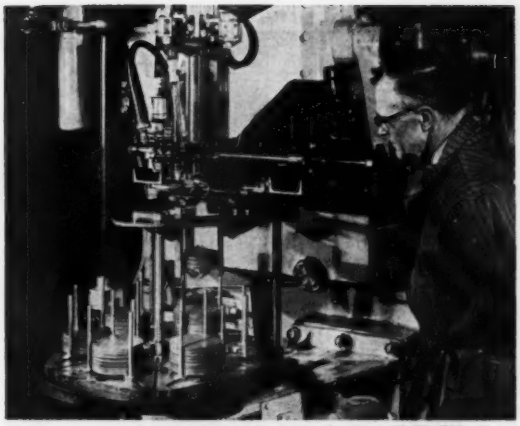
The magazine is reloaded when the blanks in it reach a low predetermined level, at which time a plunger lifts a stack from the turret table and refills the feeding magazine. The magazine holds the stack of blanks by a number of hooked fingers which are pivoted out of the way by the force of the blanks against the angular entry provided on the fingers. After the blanks have been completely lifted past the hooks of the fingers, they snap under the last blank and the lifting plunger retracts. The turret table then indexes to bring one of the filled nests in position for the next reloading of the feed magazine; at the same time, the empty nest has indexed to where it may be refilled with blanks, commonly referred to as "cookies".

All of these movements of the stack feed, the turret table, lifting plunger, and the feed magazine are controlled by a number of limit switches that not only control the operating function but also check as to whether the operating function was performed properly; if it did not, the machine will stop.

The developed blanks are lifted out of the magazine by a vacuum cup or cups which receives its up and down motion from a cam or eccentric yoke which is mounted on the extension of the main crankshaft. When the vacuum cup has picked up a blank and begins to elevate, a blast of air from a positioned tube will blow off any other blanks that may have adhered to the blank that is being lifted by the vacuum cup.

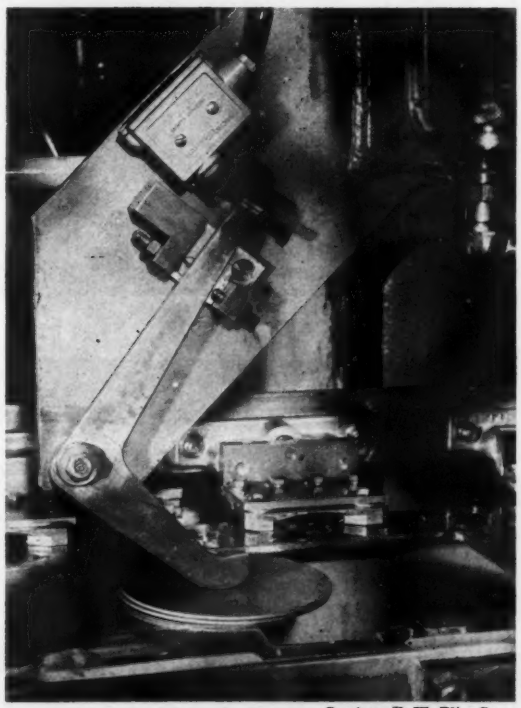
When the blank has been lifted to the maximum point, the transfer mechanism moves in and grasps the blank and shuttles it to the second station, releases the blank, and moves back to its starting position during the cycle of the stroke. Simultaneously, the transfer mechanism is grasping the part in each of the other individual stations and transferring it into the following station.

The second station is often provided with a limit switch setup that checks the blank thickness for over-gauge thickness or the possibility of double blanks. Either of these two evils could cause extensive damage to the dies or press, but the safeguard limit switch stops the press. In more elaborate security, the limit switch would open a trap-door and the double blanks or over-gauge parts would fall through the trap into a receptacle beneath the press. This type of security permits the press to continue without stopping, for no harm can be done if a part is not carried through the transfer stations.



Courtesy, E. W. Bliss Co.

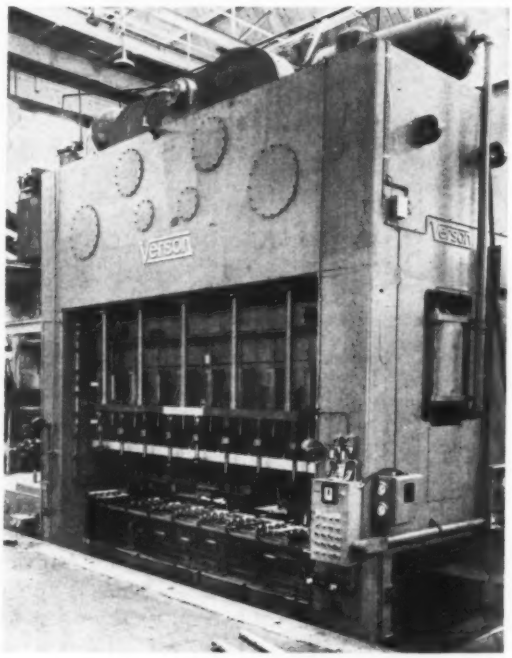
Fig. 6. Rotary stack feed at end of press feeds unit stock into the press, assuring constant work supply and no loss of machine time for replenishment of supply. The elevated gripper finger magazine is automatically refilled, when necessary, with the nested stack of blanks beneath it. A vacuum cap holds a blank ready to be grasped by the transfer mechanism.



Courtesy, E. W. Bliss Co.

Fig. 7. An over-gauge blank, or double blank, will lift this feeler sufficiently to close a micro-switch and actuate a solenoid, opening a trap door in the press bed. The blanks fall through, the door closes, and the press action continues without interruption.

TRANSFER PRESS
CASE HISTORY NO. 4



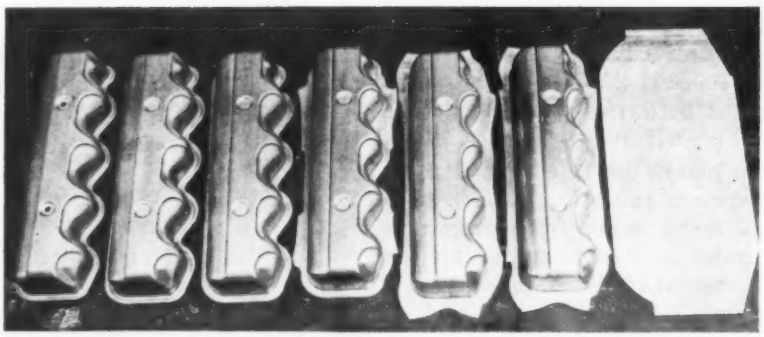
Cylinder Head Covers

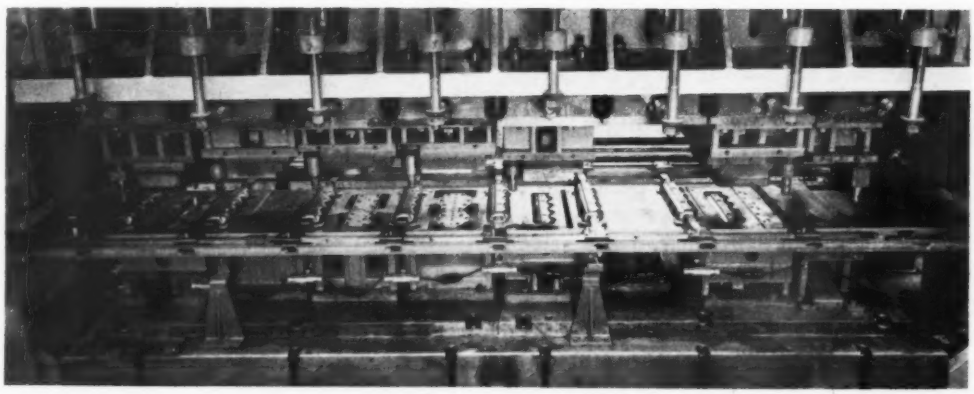
Non-concentric parts are successfully produced in this 2-point Transmat with individually adjusted, multiple die stations and punch slides. Cylinder head covers are produced on this 1000-ton unit at the rate of 20 pcs/min.

Eight individual dies are used, the pitch distance between punch slides being equalled by the transfer slide's fixed distance of travel. Fingers on the transfer slide advance workpieces from station to station, from right to left.

Parts are shown as they appear after each successive operation: Notch; cutoff and draw; restrike; partial trim; finish trim; bead flange; pierce, flange, and riffle. Dimensions of the finished part are 19⅛" x 5⅞" x 2¾".

Courtesy, Verson Allsteel Press Co.





Another type of stack feed shuttles the blanks in a straight line movement from two points instead of a rotary movement as is performed by a turret type. Although more simple in design than the rotary type, it appears to be more adaptable to odd-shape blanks. Naturally, more vigilance must be employed to see that the stacks are loaded because there are only a few nests.

All rotary turret stack feeds are not as automated as those previously described; some are hand operated. That is, the turret is rotated by hand and the blanks are raised out of the nests by a hand crank elevator. This type requires an occasional stopping of the press for the loading of the feed magazine.

Still another type of stack feed removes the developed blanks from beneath the stack by a vacuum cup. This type is simpler in design than the rotary type and has proven quite successful. Here again, more vigilance is required to keep the magazine loaded. Blanks can also be removed from beneath the stack by a cylinder or cam-actuated push rod.

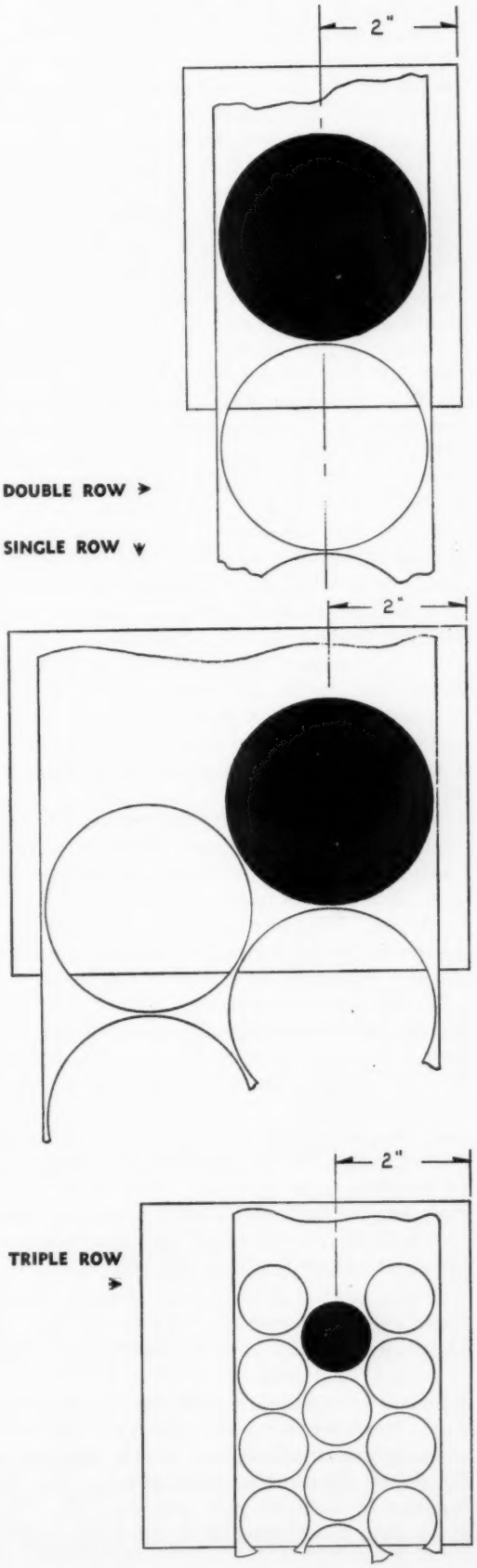
If you elect to feed *coil* stock directly into the transfer press, you would have the advantage of producing the stamping complete without requiring the use of any secondary equipment to produce the blanks. When the transfer press is operated in this manner, it becomes an "automatic factory" — an island by itself.

A particular advantage is gained by feeding coil material to the transfer press, for material not of the proper quality would instantly be recognized since the out-coming parts would immediately show up the failing; consequently, the material could be rejected before any appreciable trouble results. This is not the case in the feeding of blanks, for these blanks may have been made weeks before and, unless the material was subjected to various precautionary tests to assure the quality of the material before blanking, it is possible for many "headaches" to be caused by unsatisfactory blanks.

To understand fully how coil stock is blanked in the blanking station, let's follow the steps to be undertaken to start it in the transfer press.

A coil of material is placed in the stock cradle. The end of the strip is passed through the stock straightener, then through the roll feed, then through the lubricating sponge box, and finally through the stock guides of the blanking die, usually at right angles to the direction of subsequent work travel through the press.

The blanking die normally is on a second (higher) level, for the blanking punch must cut the blank and drop it through the die into a slide arrangement. (Not to be confused with



the transfer fingers). As the crank is on its way up, the slide arrangement moves the blank to the second station. After the crank starts down on its cycle, the blank slide retracts. Thereafter the transfer finger arrangement moves the part from die to die. While every station is behaving in the same pattern, the scrap material is being chopped in a scrap cutter at the rear of the press or, in the case of multiple row material, it is being rewound.

It is desirable that the material be wide enough so that two or even three rows of blanks can be cut from the strip. If a single width strip of material is run through the die, you will not have taken advantage of stock savings that occur when interlaying blanks by passing the strip through two or three times. This is one of the strongest arguments in favor of transfer press blanking. When the material is used to permit a *double* pass, it is run through the machine the first time and recoiled. Then the coil is loaded and started again in such manner that blanks in the second row will be blanked exactly between the centerlines of the previous cut blanks.

Some machines are equipped with a feed finger that "picks up" the scrap between the previous cut blanks and assures the proper feed distance to take place and prevent the possibility of overfeeding, which would result in incomplete blanks.

With periodic stopping of the press to load and start a new coil, or punched coils that have been rewound after the first or second pass, the full potential output of the press is not achieved. This rewinding can become time consuming and the stock extremely delicate to handle, especially in thin-gauge material.

If this should become a major problem, presses are available equipped with a "zig-zag" feed. This type of stock feed permits a single pass of the material, but two rows are punched in an interlaid pattern. With this type of feed, the outgoing punched waste material is cut up with a scrap chopper to relieve the annoyance of handling such material. With such an arrangement, the press is kept operating more continuously, the only lost time being the time required to load and start the coils.

If you elected to run *three* rows of blanks from a strip of material, the center row of blanks would have to be processed first. This is done so that both outer rows of blanks are interlaid in association with the precut center row. However, there are problems that exist in three pass that must be clearly understood since they affect proper press selection and the number of stations that are required. The stock strip and tooling in the blanking station overlap the second station, resulting in the operational loss of this station. The loss of one station may mean subsequent handling and a secondary operation in another press. To understand this problem, I will attempt to illustrate it by giving you a run-down in this manner.

Theoretically, the maximum blank that can be progressed through the press is of a diameter equal to the pitch distance between stations. See chart on facing page. If the second station is idle, and a draw is performed at the third station, the major diameter of the part is thereby reduced and there will be no interference between tools at succeeding stations. However, the standard capacity of a machine is limited to the largest diameter that can be safely blanked without interference with the second station.

For example, if the center distance of the stations is 4″, the blank size would be 3″ with a ½″ allowance on each side of the die opening as die wall. This type of die would accommodate a single pass strip. If a double pass strip were required, the die could be made wider on the side opposite the second station to accept the multiple width stock.

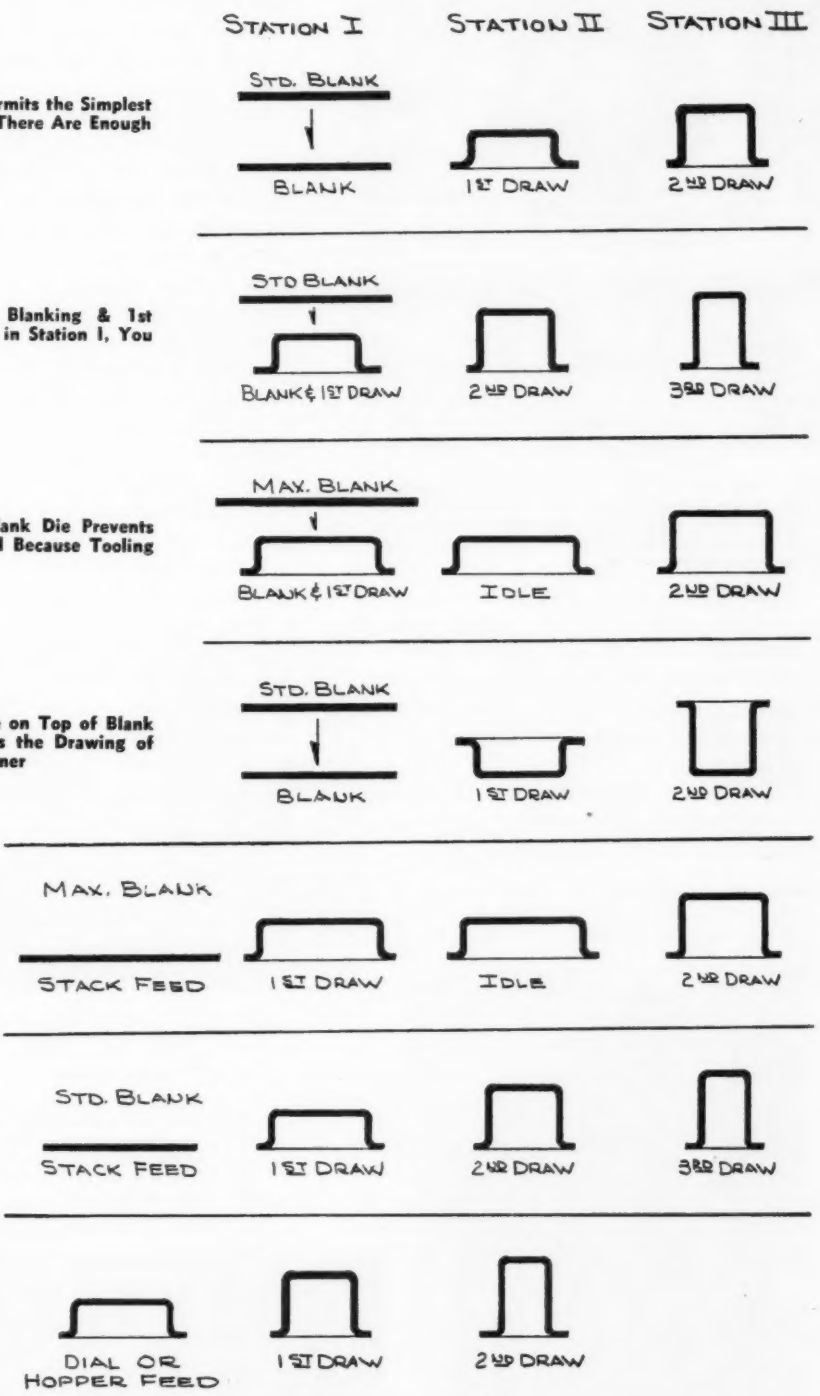
Remember that the centerline position of the blanking punch must never be changed because the transfer arrangement always moves its same increment of travel. Double pass material will also permit the standard blank size, for the material is inverted during its second pass. However, if triple pass material is to be processed, the permissible blank size is greatly reduced. Example: If the center distance of the stations is 4″, the largest standard blank is 3″ for a single pass and also for a double pass, but it is only 1⅛″ for a triple pass. When a triple pass is used, the center row is blanked first and any increase of blank size beyond 1⅛″ would cause interference with the second station.

When multiple strips are used, a feed finger is employed on the feed mechanism to position the cutout openings for porper interlay. When strip stock is being fed into the transfer press, you have the option of making plain blanks in the first station or blanking and drawing if it is essential. However, if the maximum blank is used, it is desirable to blank and draw in the first station and leave the second station idle to prevent over-lapping of tools. See third-row example in chart on facing page.

GENERAL OBSERVATIONS

A particular advantage of transfer press operation is that the parts as they process through the stations become quite warm or hot. The

METHODS OF TRANSFER PRESS PRACTICE



Standard Practice Permits the Simplest of Tooling Provided There Are Enough Tooling Stations

By Combining the Blanking & 1st Drawing of the Cup in Station I, You Save One Station

The Overhanging Blank Die Prevents the Use of Station II Because Tooling Will Overlap

Blankholder Pressure on Top of Blank in Station II Permits the Drawing of the Cup in this Manner

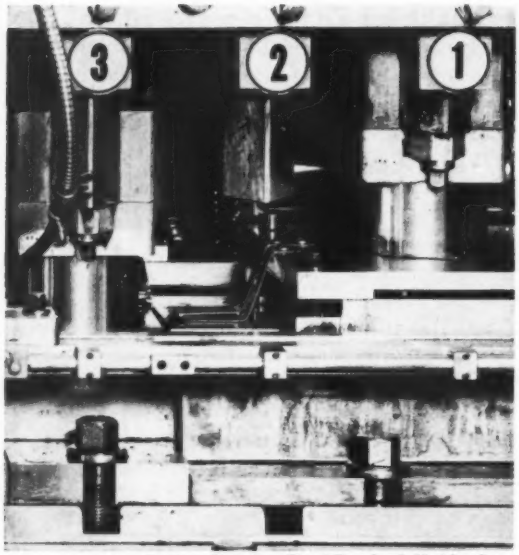
When Maximum Blanks Are Used, Station II is Idle to Prevent Interference of Tools with Station I

The Normal Treatment When Standard Blanks Are Used. The Space Between Parts Permits the Building of Efficient Tooling

When the Press Does Not Have Enough Stations, or Because of Lack of Tonnage Requirements, Preliminary Work is Performed on Cups, Then Fed to the Press

MAXIMUM BLANK: The Pitch Distance Between Stations

STANDARD BLANK: The Pitch Distance Minus the Amount of Safe Die Wall Required to Permit Blanking without Interfering with the Stations



Courtesy, Waterbury Farrel Foundry & Machine Co.

Fig. 8. The maximum blank that can be produced is limited by the distance between the plungers. When the blank diameter approximates this distance, the second plunger can't be used, for the blank die overlaps the second-station area.

parts in this condition process safely through the stations for they do not have a chance to reach room temperature or pile up for days as in conventional type press operations, which in some cases leads to age cracking during subsequent draws.

In all fairness to other progressive type tooling, it must be remembered that the transfer press excells in the mass production of parts only when the runs are exceptionally large. Once the machine is set up, it runs for a long time. The setup time required to have the machine in proper working order often prohibits its use as a practical machine in the custom stamping shop.

Very few job stamping shops in the country are equipped with transfer type presses, especially those that produce large stampings. Usually the manufacturer of the end products equips himself with the transfer press and tooling and produces his own parts in his own plant. This applies to large stampings only; not to small miniature parts such as grommets, eyelets, and other standard specialty items that are used universally as standard assembly components. The specialty shops that excel in this stamping technique have amassed such a large stock of tooling that by the incorporation of a change in just one station they often can produce an item to meet your specifications.

The tooling costs to produce an item on transfer presses are extremely low in comparison to tooling for a progressive die. However, the long setup time involved in making a complete changeover of tooling and the expert skill required in proper setup of the press has its drawbacks but it does have its compensations for once it is set up and running it runs for a long, long time. It can be observed that the setup of each individual station involves blank-

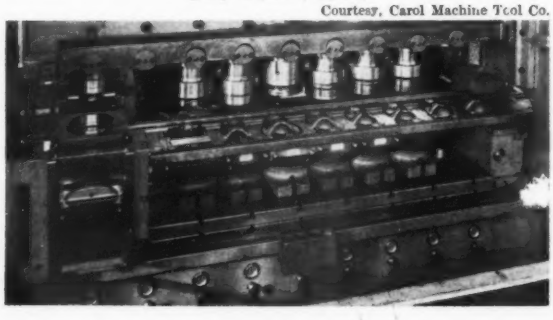
TRANSFER PRESS
CASE HISTORY NO. 5

Headlight Housings

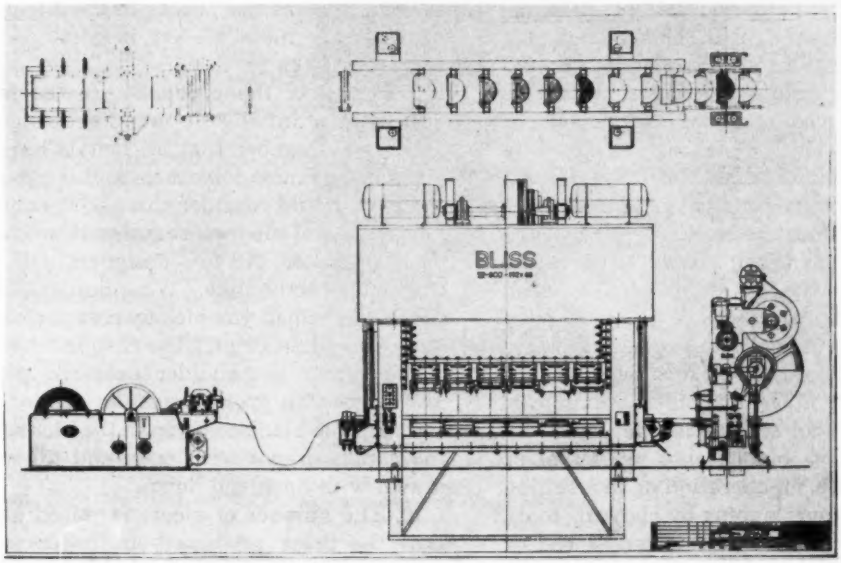
Two rows of blanks in an interlaid pattern can be produced from coil stock by means of the "zig-zag" feed on this 10-station Weingarten press.

Single row blanking is used where close to maximum blanks are required, as on this set-up for production of headlight housings in seven stages. Feed fingers are equipped with a feeler pin device which will shut off the machine in the event the finger does not grasp a part properly.

Courtesy, Carol Machine Tool Co.



TRANSFER PRESS
CASE HISTORY NO. 6



Refrigerator Shelves

All the shelves and pans needed for more than 500,000 refrigerators a year are turned out on three transfer feed presses at General Electric's Appliance Park.

On the two shelf lines, mill coils are loaded into the cradle at the left. Strip from the cradle is fed through the five-roll straightener, into the roll feed, and into the first station of the 800-ton, 7-station press.

After the blank is cut off at the first station, the transfer feed fingers, driven by cam and gear linkage from the main shaft, moves in on the workpiece and carries it to the next station. Simultaneously, parts are advanced from each other station.

Finished parts, 15/min from each transfer press, are fed automatically into 800-ton embossing presses. Embossed parts are then unloaded by hand to permit visual inspection.

Courtesy, E. W. Bliss Co.

holder pressure, ejection controls, transfer fingers, and automatic lubrication, in addition to the automatic blank loading device and the numerous limit switches required for safety. All of these changes in installation or adjustment are delicate and precise requirements for the setup man who is expected to have the knowledge of a metallurgist, the know-how of an engineer, and the skill of a toolmaker.

You must remember that the transfer press produces only one piece per stroke, unlike the dieing machine where numerous multiples can be produced per stroke. There are instances where numerous parts have been made per stroke, but this involves highly specialized tooling and is not the general accepted practice in transfer operation.

At least one manufacturer has devised a die in which replaceable tooling can be inserted to use the transfer technique in an end wheel type press, and has been highly successful in the production of transferred parts without the large investment required in the purchase of a standard transfer press.

There seems to be a need in the job stamping industry for a die in which tooling can be inserted to transfer through two or three operations and operate in a conventional press.

10 POINTS FOR PROPER PRESS SELECTION

1. The size of the developed blank determines or guides you in the selection of the proper size machine that will have a center-to-center distance between the punch holding

settings greater than the developed blank diameter.

2. The working pressure or the tonnage requirements of all the operations should never exceed the machine's rated tonnage capacity. To reduce tonnage requirements such operations as blanking, coining, embossing, or marking can be produced on machines independent of the transfer press.

3. The maximum height of the deepest drawn shell is the guide to the required stroke of the crank. It must be remembered that the transfer arrangement can't begin to move the workpiece until the longest shell has been cleared by the rising punch.

4. The number of operations required dictate the number of plungers or tool settings that will be necessary in the machine. Sometimes, an operation or tool setting can be gained by feeding developed blanks into the transfer press. Sometimes, an operation or tool setting is lost because of overlapping by blanking tools.

5. Type of feed must be selected — roll or hitch feed for coil material; dial, hopper or belt feed for pre-drawn cups; vacuum cup pick-up, stack or magazine feed for precut blanks.

6. Gauge or thickness of material can affect the tonnage requirements of the press. If the addition of the blank station is included in the setup, problems may occur in the blanking of heavy-gauge material. If it does, pre-blank and use a stack feed.

7. Design of the products. Is the product designed to intelligent manufacturing tolerances? Remember that all metals have variables in thickness tolerances and the design of the part should consider this allowance.

8. Design of the tools required to produce the part complete. No two designers will design the tools exactly alike. What design to pick is a problem. Shall you pick by past performance and experience, or pick the cheapest tooling?

9. Type of blankholder pressure required. The hold-down pressure can be applied either on top of the blank or beneath the blank. Either the cup is drawn with open end up, or it is drawn with open end down.

10. The number of pieces required per day. Will the press produce your production requirements? Stack feeding will produce the greatest quantity if large pieces are being produced.

end

USERS DISCUSS PROS AND CONS OF CERAMIC TOOLING

PERHAPS THE BEST WAY TO EVALUATE the usefulness of ceramic cutting materials is, as J. F. Allen told the American Society of Tool Engineers' Ceramic Tool Symposium, "with restrained enthusiasm." With a few exceptions, companies which have worked with ceramic (or oxide) cutting tools report that the comparatively new materials still have a long way to go before they will be accepted widely for production work; that ceramics today are at the same stage of development as carbides were 25 years ago.

Ceramics are "unpredictable, often incorrigible, and unstable," says Mr. Allen, factory manager of Cameron Iron Works, Inc. in Houston, Texas. Yet, he is quick to add, "they are capable of outperforming other known materials to a degree that demands healthy respect."

To find the full range of ceramics' usefulness in production machining, it seems that industry is going to have to do additional testing and evaluating — of the cutting material in general, and of individual brands — to find out just where they can be applied most effectively.

The physical and chemical characteristics of ceramic cutting materials indicate their potential value in metalworking. They are hard, strong, and oxidation resistant. In addition, they offer these advantages: Long tool life because of their hardness at room and elevated temperatures; resistance to "built-up edge" during machining because metals do not weld to ceramics; improved control of workpiece size because of reduced cutting edge wear; improvement in crater formation; and improved workpiece finish.

For finish turning there is no arguing about the usefulness of ceramic cutting tools, experts agree. Their success is practically assured, according to Mr. Allen, when these rules are followed:

- The machine must have ample spindle speed and power.
- The machine must be free from excessive vibration.
- The cutter must be well supported, and with a minimum of overhang.
- Sudden shocks and interrupted cuts must be avoided.
- The length of cut in the operation should be of sufficient duration to actually result in a time savings of some consequence.

Tests undertaken by The Warner & Swasey Company concur with this, according to Alfred O. Haeme and Robert T. Hook, tool superintendent and chief metallurgist, respectively, at W & S. On uninterrupted cuts the use of ceramics as a complete replacement for finish turning work in place of the harder grades of current-day carbides is almost a foregone conclusion, they told the ASTE symposium. Out-of-roundness, scale, and uneven amounts of stock seem to be the limiting factors for ceramic cutting tools.

These latter factors limit ceramics' use as roughing tools. Cameron Iron

Works found out through experimentation, however, that ceramic tips should be successful where more than one roughing cut is required for stock removal. At Cameron the portion of the tip which was buried in the cut suffered little or no damage during the roughing operation. But, the portion exposed to the impact of the chips became severely damaged. By developing and using a "tip protector," Cameron tool engineers found part of the solution to this roughing problem.

The greatest promise for ceramics, believes Mr. Allen, lies in the fact that ceramic tools will be cheaper than other comparable materials. "Tool breakage will probably become negligible as an economic factor," he said in Houston, "because of the amount of work that the ceramic cutters will be able to perform."

A great advantage of ceramics, he points out, is that when the material breaks in use, it chalks away, leaving the workpiece undamaged. Looking to the future, Mr. Allen predicts that perhaps tool engineers and designers will develop magazine toolholders for feeding the low cost, expendable ceramic tips into cutting position as required, for roughing and finishing cuts alike.

In setting up the work with ceramics at Warner & Swasey, six general operating principles and goals were followed. Through these, W & S engineers feel ceramic tools will achieve their greatest gain in cost reduction. They are: 1) Select these jobs which are now ground for accuracy and finish, transfer them to a lathe or turret lathe, increase the speed, use light feeds, and obtain a result sufficient to meet blueprint specifications. 2) Pick second operation jobs on turret lathes which have a reasonable amount of cutting length available and substitute ceramics for cutting the remaining portion. 3) Select heat treated parts where workpiece hardness would greatly reduce cutting speeds with carbides as compared with those that might normally be expected with ceramics. 4) Select parts which are now being finish turned with carbides. 5) Find a method for attaching ceramic tips to tool shanks by a bonding agent other than metallizing and silver soldering; one which the average shop might use. 6) In addition to results from single point turning, explore very carefully the performance of ceramics for milling.

To show the effect of the known ceramic cutting materials on production parts at W & S, computations were made on five parts, showing the change in floor-to-floor time for the entire operation on which the ceramic cutting took place. Time savings credited from using ceramics ran from 57% to 10.5% in these tests. Although ceramic feeds were slightly lower than those used with carbides, ceramic speeds were considerably higher.

TRY THIS FOR CUTTING SPEED: Using a ceramic tool, cut a 13" dia blank of 1040 steel 3½" long using a feed of 0.011"/ rev and depth of cut of 0.040". Actual speed rose to 16,454 sfpm on this specially designed turret lathe during tests at Ohio State University for Warner & Swasey Co. Cutter life was only one cut per tool edge at this exceptionally high speed, however.

Work done at Warner & Swasey with ceramic tools prompted Mr. Haeme and Mr. Hook to draw the following conclusions at the ASTE ceramic sessions:

- Ceramic tools have a definite industrial use in finish turning operations.
- With proper care, ceramic tools can be used succesfully on first and second operations on turret lathes.
- Existing clamp-on tool holders are not adequate for use with ceramics as they are today; the ceramic tips are fragile, so stronger tool holders must be designed to offset this weakness.
- Triangular tips are not as successfully used as square ones because of insufficient backing.
- Present clamp-on tools designed with harder grades of carbides in mind do not have enough rigidity and their geometry is such that the maximum cannot be obtained from ceramics as they are now made.
- No advantage was observed in the slug-type ceramic (½" square and 1½" long) because in the event of failure, fractures took out excessive amounts of the ceramic.
- Use of coolants has no apparent advantage or disadvantage other than operator inconvenience with their use.
- There is a tremendous difference, performance-wise, between various makes of ceramics.
- Speed ranges of 400 to 1,000 sfpm with feeds of 0.004 to 0.002 ipr and depths of cuts from 0.010" to 0.375" seem to be practical.
- The use of a negative land on the side cutting edge, 30° from the vertical of the workpiece and ground to a width representing approximately 80% of the feed rate, gives a definite improvement in tool life.

Tests reported by E. J. Weller, manager of the Carbide Products Design Engineering section of General Electric's Metallurgical Products Department, show that plain carbon and alloy steels and cast irons of medium to high tensile strength have been most satisfactorily machined with ceramics on existing equipment. The ability of the ceramic to resist high cutting temperatures shows to an advantage, he said, when machining these materials. Where abrasion of the tool is more of a problem or where the limitations of the part or machine tool result in cutting conditions conducive to chipping the ceramic, General Electric tool specialists found that carbides outperform ceramic tools.

Work being undertaken at Curtiss-Wright Corporation's Aeronautical Division indicate that it is important to distribute tool clamping forces evenly over the tool blank when using ceramics. A chip breaker is important, according to Norman Zlatin, consultant for the division. "It should be wide enough," he told ceramic forum attendees, "or excessive heat results."

Other tests at Curtiss-Wright indicate that the ceramic tools now available are not satisfactory for machining titanium alloys and high temperature alloys. On the high temperature alloys, tool wear is rapid, the ceramic chips readily, and then fails completely. end

A Plan for Safer Plants

Investigating Injuries

Second of a series prepared with the cooperation of the Greater Cleveland Safety Council

INJURY INVESTIGATION is more than mere fact-finding. To accomplish its purpose most fully, the information so gathered must be used. Reports of such investigations can increase safety consciousness among employees and show where to take corrective measures to eliminate the recurrence of similar accidents.

In addition, fully detailed reports prepared after the investigation is completed, along with complete medical reports, are extremely valuable when compensation claims are made. "Make sure that the facts about the accident are in the compensation bureau's files immediately after the accident . . . not in some supervisor's head," W. C. Hartman, Cleveland attorney, told a group of Small Businessmen recently. Claims can be settled much more quickly and economically when the facts are in writing and in the bureau's hands, he maintains, soon after the accident has occurred.

Facts such as what the injured worker was doing, what happened, how he was injured, and where should be noted on some type of accident or injury report. Whenever possible, workers should help determine what happened and how and what can be done to prevent similar injuries. Such cooperation with employees, safety experts agree, increases their awareness to the plant safety problem.

Using the reports as the basis for departmental safety discussions is another way of drawing all employees' attention to the subject. Posting the reports often prompts employees to adjust their work habits and methods in an effort to avoid similar accidents.

If an injury is serious, Safety Council advisors recommend that a preliminary investigation be made at its site, as soon as possible after the injured person is receiving medical care. The accident site should be left untouched until the preliminary investigation is completed.

A representative of management should visit the scene of the accident, study it and note all conditions: What machine was the man operating, if any? What was the apparent condition of it and of the surroundings? Was the floor slippery, rough, uneven? Was the lighting adequate? Where was the material being used piled? What was the condition of the working space? What facts do witnesses have to offer? These are some questions to be answered.

Once all the questions are answered, the machine or site can be straightened up and made safe for others to work in, and production can be resumed.

When the doctor gives approval, the injured person should be questioned about the accident. His story of what happened and how, who and what he feels were responsible, and what he feels should be done to prevent such accidents in the future, are important.

A written report of some kind should be prepared after the facts have been gathered. This is important, as mentioned previously, for initiating preventive measures, boosting employee interest in safety, and for the compensation claims files.

In the case of relatively minor injuries, when the injured worker is able to return to work immediately, injury investigations and reports are still important.

Chronological records of investigated injuries are recommended by safety experts. Printed forms are most frequently used. These enable management to review the injury situation regularly, to note "repeaters," hazardous operations and nature of injuries, and to take action accordingly.

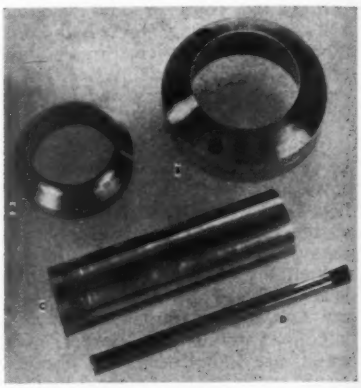
Accident Reports Should Tell . . .

- What the injured worker was doing, when, where, and what happened.
- What unsafe acts were committed by the injured or other workers involved which contributed to the occurrence of the injury.
- What unsafe conditions contributed to the occurrence of the injury.
- What additional preventive action should be taken.

BONDING CARBIDE TO STEEL

A unique bonding method that makes possible the joining of carbide to steel in a union strong enough to stand up under the most punishing punch press production has been developed. This has made possible the use of tungsten carbide in applications heretofore difficult, and has made other normal applications more efficient and economical.

The material used is Weldalloy, made in two series, Weldalloy A and Weldalloy B. Weldalloy A is used as an intermediate joining material between carbide and steel, forming an ideal cushion between the two. Hardness can be varied from Rockwell C20 to C50. Heat treatment can be applied to air hardening steel after joining with carbide so that the entire piece may be brought to any desired hardness. Core rods for dies for powder metal parts are being produced in this way, such as shown in the illustration, Part D.



Weldalloy B alloys are used as casing materials to reinforce carbide inserts. Readily machinable, their hardness range is Rockwell B80 to B100, as molded. They are used as jackets around carbides or as cores.

Part C is a typical application of Weldalloy A. It is a punch consisting of a carbide ring bonded with a 3/16" layer of Weldalloy A to soft steel. The punch is used for stamping out bottle caps. Part A is a thin carbide ring with Weldalloy B casing, finish machined and carbide ID finish ground after the casing was molded around the rough carbide ring. It is a cutedge used for bottle cap stamping. B is a cutedge for stamping beer can tops.

Welded Carbide Tool Co., Inc., developed the process and applies Weldalloy to any grade of carbide on inserts of its own manufacture or carbides procured from other manufacturers.

BUY U. S. SAVINGS BONDS

$23 Repair Saves Big Stretch Die

THE ACCIDENTAL DROPPING of an epoxy-faced stretch die at Avro Aircraft Ltd. in Toronto, Canada's largest plane manufacturer, caused one entire end to shear off and also ripped a wide gash along the bottom edges of the epoxy facing. This production die (13′ long, 12″ wide and 8″ high) forms the outside skins of fuselages for the CF-105, Avro's new jet delta-wing interceptor.

Similar damage to a die faced with other types of tooling materials may have meant scrapping the die. However, the fact that an Epon* resin-based formulation had been used to face the Kirksite core of the die, enabled the tool department to repair the die at a total cost of only $23 for labor and materials.

The versatility of these epoxy resin formulations in aircraft tooling makes possible not only economical repair, but also a minimum of effort for changes in tool design. Because aircraft components are subject to rapid change, the revamping of dies, jigs and fixtures was formerly a costly and time-consuming procedure. Now such tools can be modified readily. Usually no more than an overlay or build-up with the same casting compound, followed by surface sanding, is required. Avro toolmakers in many cases are able to make design changes and also to resurface worn sections while the dies remained locked in the presses.

Widely used in the aircraft industry, Epon resins have exhibited exceptional dimensional stability, impact strength and adhesion to most materials, as well as long wear, low shrinkage during cure, and minimum residual stress.

According to Harold F. Young, chief production engineer, and Reg Whittington, tool superintendent, the almost exclusive use of these epoxy resins in tooling for the Avro CF-105 has resulted in substantial man-hour savings in the preparation of stretch dies, drop hammer dies, drill jigs, reference gages, milling fixtures, and airfoil master models.

*Reg. Trade Mark, Shell Chemical Corporation

Unusually severe impact broke off the end of this epoxy-faced stretch die which is used to form 75ST aluminum outside fuselage skins for Avro's CF-105 jet delta wing interceptor.

With Epon resin, the repair of minor breaks, dents, gouges and worn areas in such tools requires only the filling in and finishing. Because damage to the stretch die was more extensive than this, it was necessary first to prepare a new steel end plate. This was bolted to the die after the Kirksite core had been sand-blasted.

Small batches of the epoxy casting compound were then prepared by mixing 17 parts of catalyst to 100 parts of resin. The formulation was supplied by Kish Industries. The compound was then troweled onto the die, with a slight build-up of material over final dimensions to allow for later finishing. After the resin had hardened (about 12 hrs at room temperature), the surface was sanded down with wet sandpaper and then washed with acetone. No machining was required, for the excellent working characteristics of the resin necessitated only a minimum of effort by Avro toolmakers to obtain perfectly smooth forming contours and curves.

Avro's use of epoxy tooling resins has increased from a nominal amount a few years ago to the present 2500 lbs monthly. Young states that until a better material comes along, epoxy resins will continue to be a mainstay of the company's tooling program.

end

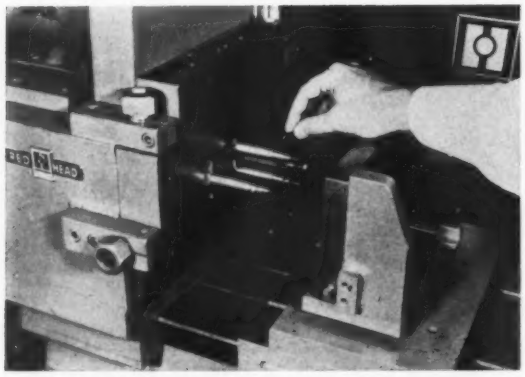
Wide gash in the bottom edge of the epoxy facing was sand-blasted before being filled in with the Epon resin-based casting compound. Here the worker sands off the build-up of material to match die contours.

New end plate has been bolted on and repair made with the epoxy compound. Final step is wet sanding to smooth the surface. Salvage of the die took only 12 hrs at a cost of $23 for labor and materials.

'Building Block' Design Lends Versatility to Precision Boring Machine

NAME THE TYPE OF PRECISION BORING operations you want to perform, and chances are that The Heald Machine Company's new Model O Bore-Matic can be arranged to suit your needs. This unitized precision finishing machine can be set up as a dozen different basic machines with many combinations of standard tooling and fixturing. Here are some of the jobs it can handle: straight and taper boring and turning; facing; chamfering; grooving diameters and faces; and reaming — and, with special attachments, contour or spherical boring or turning, and slot milling, singly or in combination.

The new machine's versatility is a result of its being designed around a number of standard, interchangeable units or "building blocks." Greatest applications are anticipated in the manufacture of relatively small parts where versatility and moderate cost are important. Instrument making operations and toolroom work are two specific uses. Because the machine can be used for long- as well as short-run operations, flexible Bore-Matics can be placed in automated lines. In such cases, when future production calls for changes in the automated line, the machine's "convertibility" can save dollars for the manufacturer.



A major feature of the new Bore-Matic is the multi-spindle unit with miniature precision boringheads which permit finishing multiple holes on extremely close centers.

The Heald Model O Bore-Matic

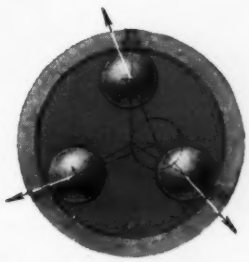
The Bore-Matic's multi-spindle miniature precision Red Head boringhead, developed for Heald for use with the Model O, is a major feature. It was developed primarily for instrument work and other precision finishing jobs requiring multiple holes on close centers or in any position within the size limits of the spindle plate, and is capable of boring on centers as close as ¾". It is designed to use interchangeable spindle plates that can be bored to fit individual job requirements. For center distances closer than ¾", a cross-slide is used for indexing to another cluster on the same plate. The device provides, in effect, a completely flexible cluster-head arrangement that can be custom-built to specific needs.

The Model O Bore-Matic is available in any combination ranging from a single-head unit with power-operated table to a four-head, double-end setup with cross-slide. Tolerances of 0.0002" can be held on regular production work.

The simplest machine consists of a precision-built base-way unit with hardened and ground box-type ways, hydraulically-operated table, rigid cast iron base, hydraulic power unit, and the necessary controls. Boringhead units, complete with motor drive, are mounted on the base ways at either the left or right end of the machine, or at both ends. From there, variations are made to suit the user. end

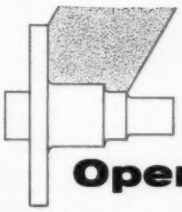
CINCINNATI

Diameters and adjacent radii and shoulders are precision ground in one operation on this CINCINNATI FILMATIC 10"R x 18" Angular Wheel Slide Grinder. Sizes available: 6"R and 10"L x 18" or 30" between centers; 10"R and 14"L x 18" to 72" between centers.



Automatic grinding wheel balancing, an exclusive CINCINNATI feature, balances the wheel and mount within a few seconds.

It Pays to Combine Precision Grinding Operations



Especially on a CINCINNATI Built for the Job

Time, effort and dollars are saved when operations are combined. And quite often quality improves, just as it does when diameters and adjacent radii and shoulders are ground in one operation on CINCINNATI® FILMATIC Angular Wheel Slide Grinding Machines. These fine precision grinders are built for high production work at the lowest cost of any equipment available today. Many features contribute to this outstanding performance.

Push-button automatic grinding cycle, incorporating coarse and fine feed rates.

Roll-out cutting fluid tank. Cuts down service attention.

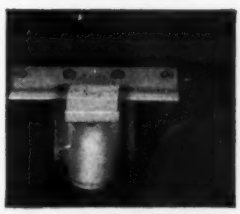
***Automatic air-electric gage sizing** with cycle time stabilizer. High degree of accuracy and compensation for wheel wear obtained automatically.

***Automatic gap eliminator.** A timesaver where stock allowance varies widely.

***Behind-the-wheel profile truing equipment,** for automatic, accurate profile truing in both directions.

Additional features and their advantages are illustrated and described in catalog No. G-686. Write for a copy. Brief specifications in Sweet's.

**Available at extra cost.*

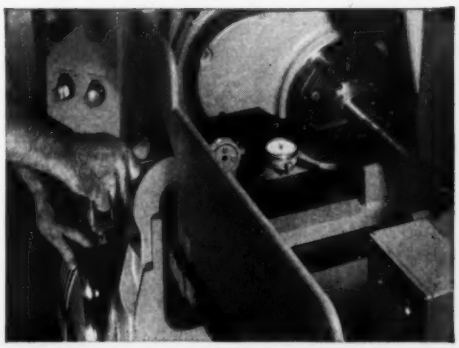


Automatic hydraulic table clamp automatically locks the machine table in position during the grinding cycle.

CINCINNATI GRINDERS INCORPORATED • CINCINNATI 9, OHIO

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPPING MACHINES



Manual flagging device, for locating the work axially with respect to the wheels, is simple and accurate. Automatic flagging device is also available.

CIRCLE INFORM-A-GRAM KEY NO. 105

New Concepts in Deep Drawing

PRODUCE MOLYBDENUM ANODES OF HIGHER RELIABILITY

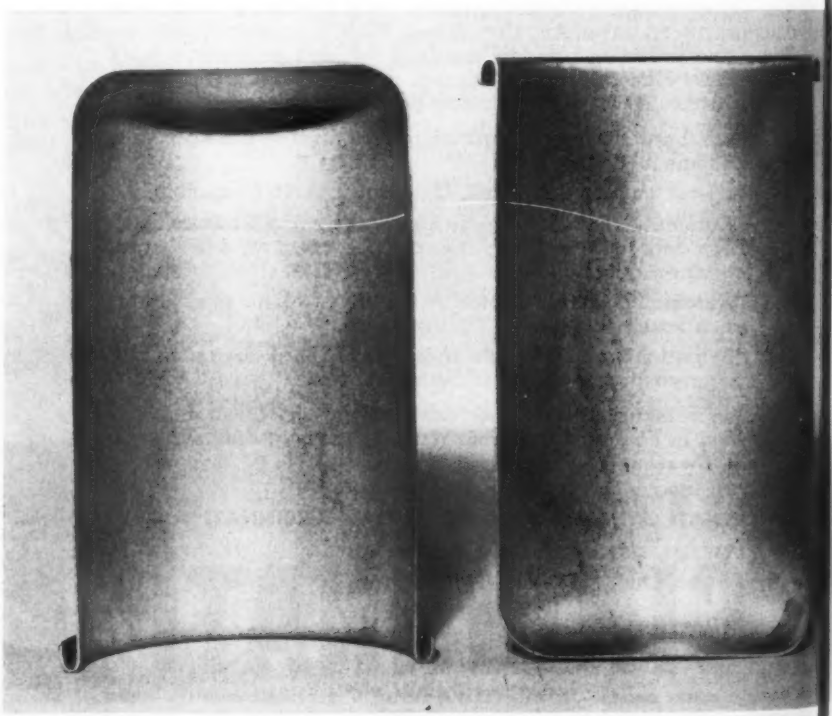
by James M. White
Assistant to Superintendent—Special Projects
FANSTEEL METALLURGICAL CORPORATION
North Chicago, Illinois

BECAUSE OF ITS DESIRABLE PROPERTIES, molybdenum has long been used as an anode material for electronic tubes.

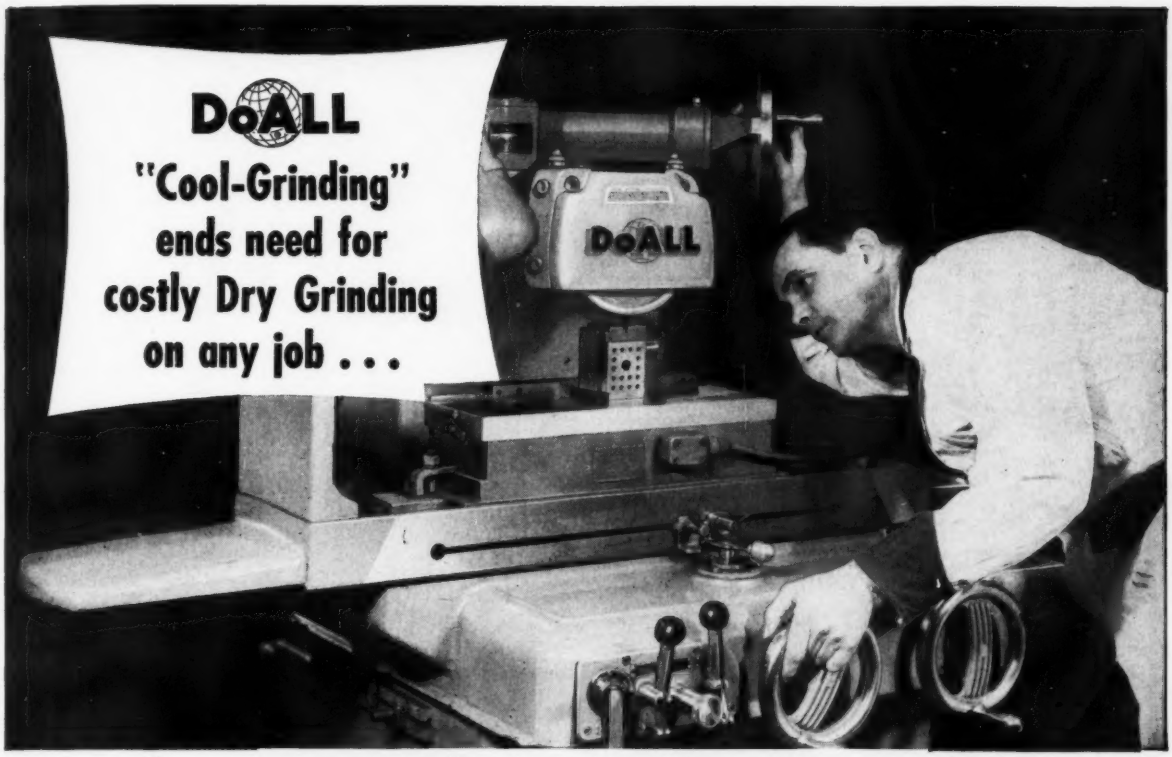
In operation, anodes get extremely hot and require an even distribution of temperature. Without uniformity of wall and end thickness, anodes will either overheat in the thin sections or be limited as to maximum temperature by the thin sections.

The perfect anode shape, a long thin cylinder closed at one end, until recently had never achieved complete success with the preferred method of fabrication — a one piece deep drawn part. Early attempts at drawing the anode from a single metal blank always resulted in a cylinder with variations in the wall and end thickness, not too useful as an anode. Consequently, anodes have always been pro-

. . . *Continued on page 110*



Cross section of molybdenum anode illustrating uniform wall and end thickness resulting from deep drawing process developed by Fansteel.



"Cool-Grinding" Attachment for DoALL Precision Surface Grinders

Coolant is fed to the sides of the wheel. Centrifugal action pulls it through the wheel and out at the periphery in a fine mist. This keeps the workpiece from overheating at the point of cut where the heat is generated. Flood cooling is also provided but can be shut off when work visibility is paramount.

SEND FOR CATALOG

. . . contains complete description of "Cool-Grinding" and all models of DoALL Precision Surface Grinders.

ASK FOR FREE DEMONSTRATION AT YOUR PLANT

You can see "Cool-Grinding" in action right in your own plant on a DoALL mobile demonstration unit. Ask your DoALL demonstration specialist to call—there is no obligation.

Coolant Does Not Obstruct Operator's View . . . User Ups Production 250%, Wheel Life 350%

In DoALL "Cool-Grinding", coolant is introduced into the sides of the wheel and flows out in a mist at point of cut. There is no heavy coolant stream and no coolant nozzle to obstruct the operator's view of the work. Hence, the only reason for ever employing costly dry grinding is eliminated.

Here is how Milwaukee Precision Grinding Corporation, Milwaukee, Wis., gained by switching from dry grinding to DoALL "Cool-Grinding" on the intricate and difficult job pictured:

1. Burning and warpage of work eliminated—formerly, losses were excessive.

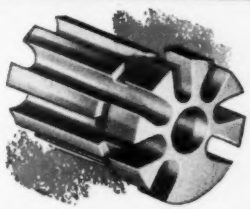
2. Finish improved—a harder, finer grit wheel can now be used.

3. Production increased 250%—they now do in two days what formerly took a week.

4. Wheel life increased 300% to 400%—costly wheel dressing taking 1½ hours now done ¼ as often and fewer wheels consumed.

Before "Cool-Grinding" was used, this job was a headache nobody wanted. Milwaukee Precision Grinding took it as a challenge . . . and found the answer.

Do you have toolroom or production line jobs you are grinding dry because the operators have to *see* the work?



THE JOB NOBODY WANTED—grinding the slots in this cavity die insert used in molding plastic sockets for TV tubes. 5/6 of the weight of the piece is removed by grinding. A headache with dry grinding, "Cool-Grinding" made it routine.

Then, find out about DoALL Precision Surface Grinders with the "Cool-Grinding" attachment. You can use coolant without obstructing visibility, increase your production and cut your costs.

Call your local DoALL Store or write:

The DoALL Company
Des Plaines, Illinois

DoALL

Friendly DoALL Sales-Service Stores in 38 Cities

Cool Grinding U.S. Pat. No. 2470350

Machines and Blades

Surface Grinders

Power Saws

Call Your DoALL Service-Store

MEASURING INSTRUMENTS

SHOP SUPPLIES IN STOCK

MACHINE TOOLS • • • • • • • • • • • • • • • CUTTING TOOLS • • • • • • • • • • • • • • •

CIRCLE INFORM-A-GRAM KEY NO. 107

Graph-Mo® dies cut downtime 50% on deep draw for round vacuum cleaner!

ENGINEERS at The Hoover Company had a tough problem in getting that round vacuum cleaner shape in the new Constellation. The two circular dies that form the hemispheres often galled, picking up bits of the steel being formed. This scored the dies, marred the finished parts. Production had to be shut down while the dies were repolished. And extra polishing of the hemispheres ran up costs still more.

After studying the problem, Timken Company metallurgists recommended dies made from Graph-Mo®—a special tool steel developed by the Timken Company. Results were outstanding. The new Graph-Mo dies cut downtime 50%. The combination of free graphite particles and diamond hard carbides in its structure make it outwear other tool steels 3 to 1. Production rolled smoothly and refinishing time was cut.

Graph-Mo machines 30% easier than conventional tool steels. And its uniform response to heat treatment eliminates distortion—saves time and money in lots of tough jobs.

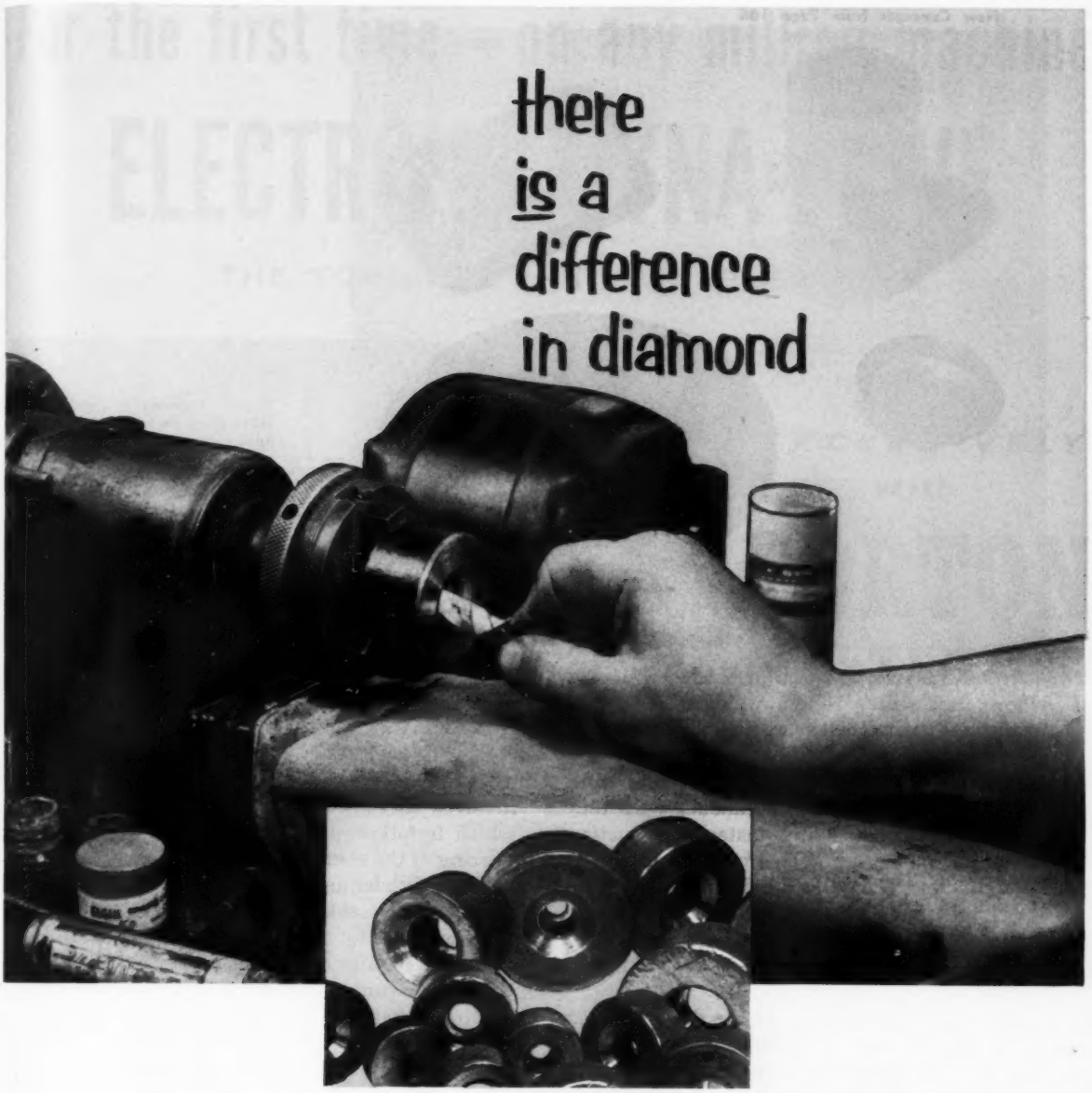
Graph-Mo is one of four graphitic tool steels developed by the Timken Company. If you would like more information about their uses in dies, punches, gages and machine parts, send for the new Timken Graphitic Steel Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN *Fine Alloy* STEEL

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

CIRCLE INFORM-A-GRAM KEY NO. 108



...the difference is

ELGIN

Only ELGIN controls all of the vital quality factors that add up to the big difference in diamond abrasives—and give you complete assurance of predictable finishing results. Make your own comparison—look for:

1. *Purity of diamond.*
2. *Cubical particle shape for efficient cutting action.*
3. *Rounded particles, the sign of reclaimed diamond.*
4. *Non-working "fines" or dangerous oversize particles.*
5. *Consistency. Check an old sample against a new one.*
6. *Particle size distribution within Bureau of Standards limits.*

You'll see the big difference in diamond, quickly, right in your own laboratory. Or ask your Elgin man to bring in a microscope. And once you've seen for yourself, you'll insist on ELGIN Diamond. The big difference in diamond will mean a big saving in your finishing costs!

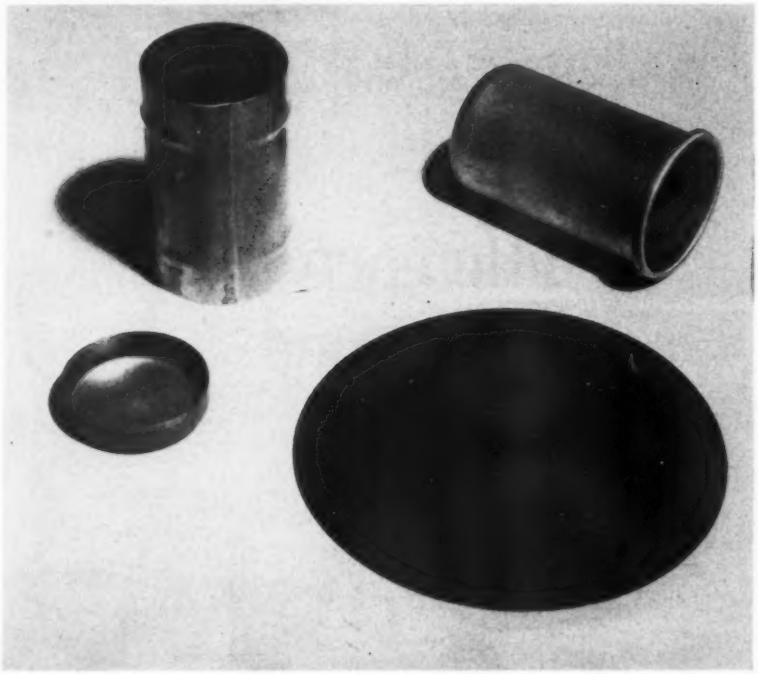
Abrasives Division

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS Dept. D

CIRCLE INFORM-A-GRAM KEY NO. 109

. . . New Concepts from Page 106



(Left) Previous method of fabricating molybdenum anodes called for welding two-piece assembly. (Right) New method produces one-piece anodes by drawing from round blank.

duced at Fansteel as a two piece assembly — a ribbed tube with a roller welded seam, which in turn is spot welded to a shallow drawn cup.

While thousands of welded anodes were being produced, the advantages which could be obtained from one piece anodes with uniform wall thickness kept Fansteel's production and tool engineering departments working on methods to produce this ideal shape.

Finally a new concept in deep drawing, combined with a more ductile molybdenum sheet (Fansteel Moly D sheet), made this dream a reality.

The successful outcome of the deep drawing process depends on many factors including the condition of the sheet, the temperature and condition of the dies, and the diligent use of lubricants.

Aluminum-bronze is used in all drawing dies because of its good resistance to wear and, more important, its low coefficient of friction in contact with molybdenum.

Castor oil is used as a lubricant on the workpieces for all press operations, and strip heaters are used on all of the drawing dies.

The shells are drawn from 0.015″-thick stock which is blanked to 4⅞″ dia. The exact process involves several drawing operations, each of which is followed by a pinch trim and a deburring of the shell's edge in a lathe.

The molybdenum anodes which are produced as a result of this exacting process are 2¾″ deep with a 1½″ dia, and have a 180° flared edge to minimize corona.

The electronic tube manufacturer now has an anode that in addition to providing the advantages of uniform wall and end thickness also provides:

- Easier assembly in the tube
- No grooves
- No welds
- Fewer tube rejects

end

Coming Soon:

"Hold that Workpiece"

"How Versatile is Gun Drilling?"

"Brazing Alloy Selection and Joint Design"

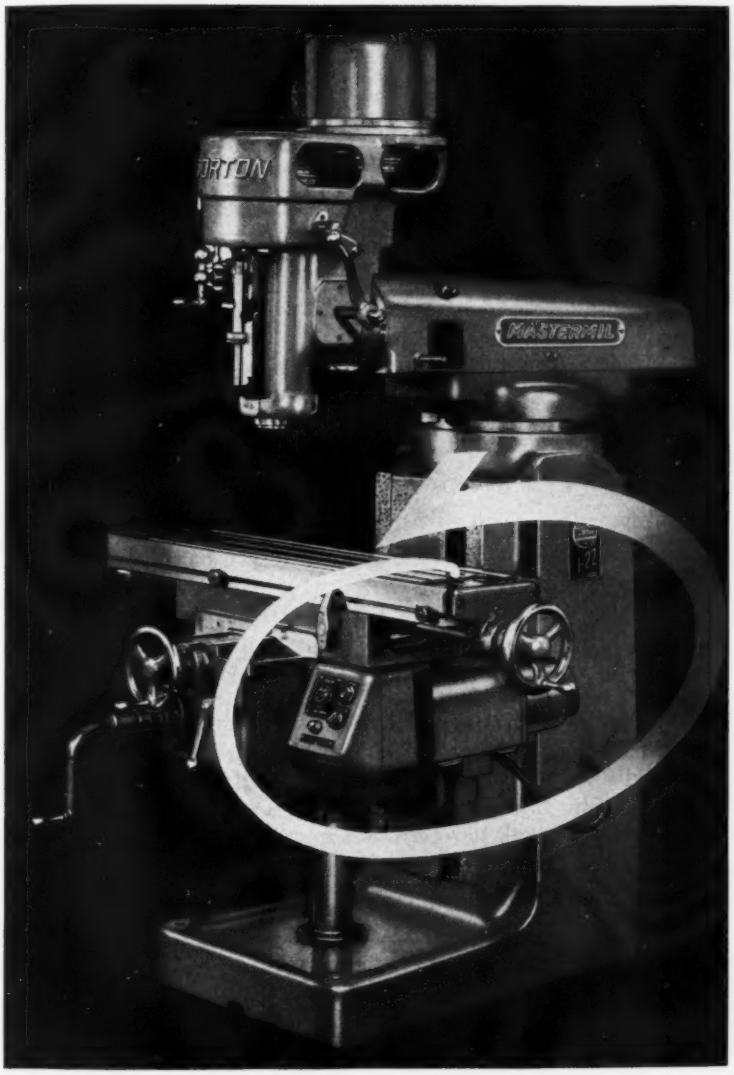
"Engineering Cams for Limited-Quantity Production"

For the first time — on any milling machine

ELECTRONIC DYNA-DRIVE

REGISTERED TRADE MARK

THE "TORQUE-THINKING" TABLE FEED



Yours *EXCLUSIVELY* with

GORTON MASTERMIL

It "feels"... as it feeds

• The exclusive Gorton Dyna-Drive® Table Feed unit "thinks while it works." It automatically adjusts to provide the exact amount of torque required. This electronic "brain" compensates during the cutting operation for small variation in density, hardness and molecular structure of the material being machined. Results are exceptionally fine finish and prolonged cutter life.

The Gorton Mastermil is precision-built throughout, simple, rugged with the finest milling head of any machine in its class. Ram adjusts in and out. Turret revolves and spindle swivels 90° left or right.

Learn more about this remarkable machine by writing for bulletin 2699-A 1206

GORTON

GEORGE GORTON MACHINE CO.

1206 RACINE STREET • RACINE, WISCONSIN

SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

A7-1003-1P

CIRCLE INFORM-A-GRAM KEY NO. 111

"SWAGGER" with GROUND FLAT STOCK

You may not have heard of a "swagger" machine, but you have probably used the steel stamps which these machines produce. This machine, by a hammer-like operation, forces square sections of tool steel into master dies. This rough, punishing operation forms the characters on the stamps. A progressive stamp manufacturer such as Greenfield Steel Stamp Works, Inc., is always searching for more economical master dies that will give longer service and greater accuracy. A basic factor is the selection of fine steels, and "Greenfield" exercises extra care in selecting, testing and heat treating their material. This is where MILFORD Precision Ground Flat Stock fits into the picture. As William H. Heubisch of GSSW says, "Ground flat stock helps to replace the craftsman who isn't always available today and

assists us in producing a quality product at a competitive price."

MILFORD Ground Flat Stock is an electric furnace tool steel, which hardens uniformly with excellent dimensional stability. The fine grain structure assures maximum toughness and high hardness necessary for master dies to make steel stamps. If you have tough, tool steel applications where initial economy plus long life are a consideration, it will pay you to try MILFORD Precision Ground Flat Stock.

For further information on the above product, write Dept. TP, The Henry G. Thompson & Son Company, New Haven, Connecticut.

Looking for
the VERY BEST?

THIS IS THE BLADE

THE MILFORD®
ALL-HARD REZISTOR®

For production cutting, there is no finer power hack saw blade available anywhere. MILFORD's unique "Multiple-Pass" milling produces sharper, more uniform teeth. Every blade is precision set—expertly heat treated to a high hardness and tough, fine grain structure. The MILFORD All-Hard REZISTOR assures you fast and accurate cutting plus longer blade life.

SEE FOR YOURSELF . . . how MILFORD performance will improve your cut-off work. Ask your MILFORD distributor to arrange—without obligation—a demonstration on the most difficult job in your plant.

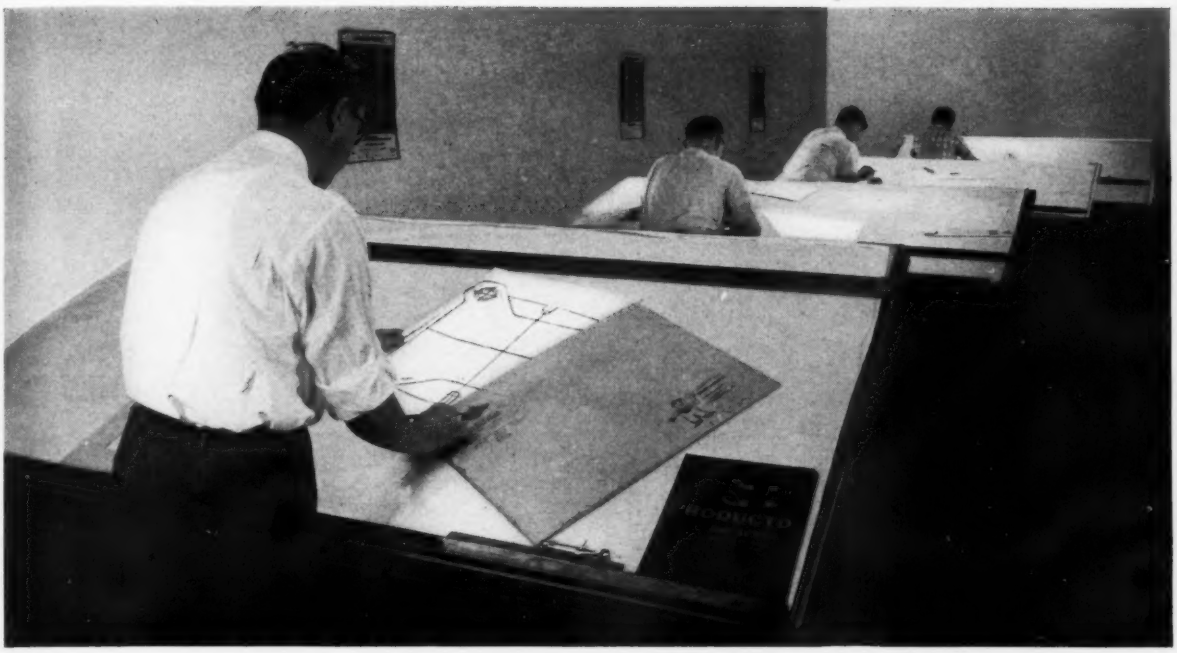
MILFORD

BUY FROM YOUR MILFORD DISTRIBUTOR . . . a local businessman who stocks the tools and equipment you need. You'll SAVE TIME, CUT BUYING COSTS and REDUCE INVENTORIES.

THE HENRY G. THOMPSON & SON COMPANY • NEW HAVEN 5, CONNECTICUT
Saw Blade Specialists for Over 80 Years
HACK AND BAND SAW BLADES • HOLE SAWS • GROUND FLAT STOCK

CIRCLE INFORM-A-GRAM KEY NO. 112

Why the Die Designer Prefers PRODUCTO Die Sets



He can specify Producto with complete confidence

The die designer likes to specify Producto die sets on his blueprints because they are a nationally-accepted "brand" They're easy to get anywhere.. and delivery is prompt.

He favors Producto because he knows he never has to compromise his die design. Even if the die layout is a little unusual, he will be able to select a die set to accommodate it from Producto's wide range of thicknesses and styles.

He also knows Producto has the equipment that can cut his tooling costs by letting him adapt his sets to a more economical *basic* design. Only Producto offers him complete foundry, pattern-making, welding and machining services for his special requirements.

The die designer recognizes Producto's Qwik-Fit Guide Pins as an important new feature that die makers want. He specifies them because they save up to 75% of the time normally required for die set assembly and disassembly.

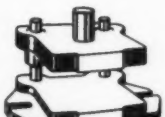
The die designer likes to use Producto's new catalog, the industry's most practical tool. His die layout is simplified when he uses Producto die set templates. And Producto provides him with cost-saving ideas in the DIE SET DIGEST.

Most important, he can depend on *consistent* Producto die set accuracy to transfer from the drawing board to the press the precision and ingenuity of his die design.

Yes, the designer has found that Producto die sets justify his confidence in specifying Producto. You will, too.

TWO FREE AIDS to more economical, efficient use of die sets are available from Producto. All-new CATALOG NO. 11 makes ordering and selection job easy. DIE SET DIGEST gives valuable tips for designers, builders and users of dies. Write for them today.

THE PRODUCTO MACHINE COMPANY
970 Housatonic Ave., Bridgeport 1, Connecticut



Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

CIRCLE INFORM-A-GRAM KEY NO. 113

SAFETY AND PRODUCTIVITY FROM THE MANAGEMENT SIDE

by Charles Cavano
EMPLOYERS SERVICE FOUNDATION
Cleveland, Ohio

For many years SAFETY in stamping plants has been a topic for discussion at Pressed Metal Institute's Annual Spring Technical Meetings. This year Mr. Cavano has approached the subject from a different angle by translating safety into dollar-and-cent values.

THE PURPOSE of my being here is to emphasize the importance of knowing the ramifications of your State Safety Code and to discuss the workings of the Workmen's Compensation Law, because, as you will see, "safety does not cost money; it pays money."

I think then that my job is to give you some case histories of how safety pays money, because if I can do that, then any money you spend on safety will be clear profit.

We must first understand from what source this money is to come, and that leads me to the subject of Workmen's Compensation.

We have had Workmen's Compensation in Ohio for over 40 years. The other 47 states in the Union all have similar Compensation Laws in varying degrees.

The question comes up time and time again to plague us; why is it that a program inaugurated with such widespread public approval in 1913 in Ohio, and regarded as having served a highly useful social function during the intervening years, is today a great mystery to many people, many people who ought to understand it?

Employers and some association officers, workers and union officials, doctors generally and some medical societies, even insurance executives, social workers, lawyers, judges and others too often only have a vague notion of what Workmen's Compensation really is and how it functions.

What then is Workmen's Compensation? It's a system of insured benefits for workers who become disabled as a result of accidents sustained in the course of and arising out of employment, and is payable without regard to the fault of either the employer or the employee.

The premiums that are paid by the employers into the Workmen's Compensation fund are supposed to be sufficient to cover the cost of compensation payments, medical expenses, administrative costs, and a reasonable reserve for future contingencies.

These premiums are paid directly, either to insurance companies in those states where private insurance alone covers compensation, or to the State of Ohio in this state, where insurance companies are not allowed to write Workmen's Compensation, and where it is controlled exclusively by the State.

In 1913 when the law first went into effect, disabled employees were entitled to a maximum of $15/week. At the present time in Ohio, employees are entitled to a maximum of $40.25/week.

Until two years ago, no payments were ever made for the first week of disability. Since two years ago, the first week is likewise paid to the injured workman, provided he is disabled for five continuous weeks.

In addition, death benefits in Ohio for widows and children amount to a maximum of $12,000, and $400 in addition toward the payment of funeral expenses.

In order to collect enough money to pay these benefits, the law provides in Ohio that the employers be classified by industry and that the rates vary according to the hazard of that industry.

As an example of how these rates vary, let's take the coal mining industry where the rate in Ohio is $24.68/$100 of payroll, as compared with the rate for stamping companies in Ohio, which is $2.28/$100 of payroll, and let's compare both with the rate for clerical office employees, the rate for which is 7¢/$100 of payroll.

This basic rate of $2.28 for the stamping industry is based on the combined experience of all stamping companies in Ohio put together.

The Industrial Commission has recognized, and it is the Commission's desire to favor those employers who practice safety within their industry by giving them an incentive. So under our law an employer in the stamping industry or in any other industry in this State for that matter, is merit rated, with the result that an employer can be penalized as much as 85% above the basic rate. If he practices safety within his plant, he can enjoy a credit of as much as 85% below the basic rate. Thus, some employers in the stamping industry in this State can enjoy a rate of

. . . Continued on Page 118

This article has been adapted from an address made by Mr. Cavano before the Pressed Metal Institute's 1957 Spring Technical Meeting at Cleveland.

cuts set-up time,
eliminates jigs and fixtures
on repetitive drilling,
reaming, tapping and
many other operations

MICRO-POSITIONER

tape controlled indexing table

The "MICRO-POSITIONER", automatic indexing table, has effected positive accuracy to .001" by providing an external, visual means of adjustment for indentation sensing and tape relocating. Also, an indenter safety switch prevents any possible indenting unless the tape is installed and mechanism is in indenting position. This table is precision made, simple, fully electric and push-button controlled. It makes possible reproduction of complex drill or tapping patterns repetitively and swiftly with very little effort or skill required from the operator. In operation, one tape controls the transverse movements of the work table and a second tape, the longitudinal movements. These movements are controlled electro-magnetically by an electric clutch which makes split second starts and stops of the lead screws as the switches sense the markings on the tapes. It is compact in design and relatively lightweight. Thus, it may be quickly moved from one machine to another as necessary. When used in combination with radial drills, milling machines, turret drills or other suitable spindles, the "Micro-Positioner" results in a universal production machine of unlimited potential.

For complete information, write Dept. TP-6

MICRO-POSITIONER DIVISION

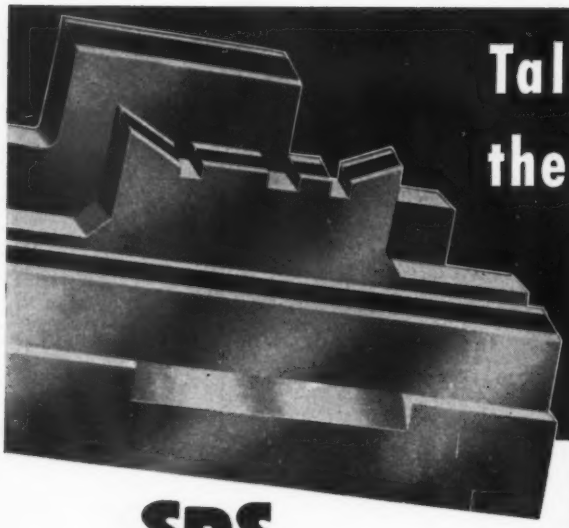
710 Wilshire Boulevard, Santa Monica, California

TOPP MANUFACTURING COMPANY

Telephone: EXbrook 4-0373

CIRCLE INFORM-A-GRAM KEY NO. 115

Talide-Tipped Blades on the job for over 10 Years!



SPS

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNSYLVANIA

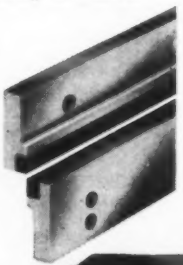
world's largest producer of socket screws, has been a regular user of Talide-tipped centerless grinder blades for the past 10 years. SPS centerless grinders are equipped with super-hard Talide centerless blades, enabling millions of precision parts to be centerless ground without downtime for blade changing, regrinds or replacements. The Talide carbide wear strip is produced by us in ONE SOLID SECTION UP TO 100" IN LENGTH WITHOUT SEAMS. A solid carbide wear strip has been proven more efficient than shorter sections brazed or butted together because the possibility of marking or scoring the work is eliminated.

TALIDE ROTARY KNIVES GIVE PHENOMENAL RUN OF 90-1...

A leading strip steel producer of razor blade, high-carbon, spring and stainless steel reports over 1200 coils were gang slitted with Talide knives compared to 15 coils with steel knives. More tonnage was produced in one regrind of the Talide knives than over the entire life of a set of steel knives. Burr-free, clean-cut edges produced with scrap rate practically eliminated.

$18,000 SAVED USING TALIDE SHEAR BLADES!

A large electric motor manufacturer shearing .014" silicon steel for transformers advises first year savings of $18,000 in blade costs after completely equipping their press line with Talide-tipped blades in lengths ranging from 15" to 87". Talide shear blades are averaging 1,000,000 cuts per grind compared to 10,000 cuts obtained with steel blades.



Over 50 sizes and styles of standard blades carried in stock—with special blades made promptly to order. Write for 76-page catalog 56-G or ask for sales engineer to call.

METAL CARBIDES CORPORATION
Youngstown 12, Ohio

EXCLUSIVE RETIPPING SERVICE

Because of its exclusive hot press method, Metal Carbides is able to rework worn, chipped out or broken areas of carbide-tipped blades back to original size and dimension with all breaks and defects eliminated.

METAL CARBIDES CORPORATION
MC
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

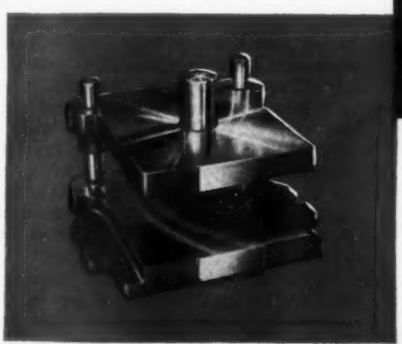
CIRCLE INFORM-A-GRAM KEY NO. 116

NOW!

All Four Horizontal Surfaces Ground

ON NEW DANLY DIE SETS

To a large extent Danly leadership in die set design can be attributed to its constant search for better methods and means to improve die sets and their operation. Typical of this is the fact that Danly Die Set punch holders and die holders are ground on both sides. By grinding all four horizontal surfaces, Danly assures a true and level alignment when punch and holder are set in the press. Isn't this another important reason why you should specify die sets from Danly?



Leading industrial distributors and Danly branch assembly plants—located in all major tooling centers—stock Danly Die Sets for fast delivery.

DANLY MACHINE SPECIALTIES, INC.

DANLY

2100 South Laramie Avenue
Chicago 50, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 117

. . . Safety from Page 114

34¢/$100 of payroll, while another employer in the same industry can be required to pay as much as $4.22/$100 of payroll. The employer's status depends upon the amount of safety that he inculcates into the minds of his foremen, supervisors, setup men, maintenance men, and the employees who operate the presses and do the other work in the stamping plant.

Now, as you can see, these rates vary radically. Let's take an example of what one accident can cost in dollars and cents to one employer.

Here is one small employer, employing less than 25 people in the stamping industry, who has an approximate factory payroll of $135,000/yr. This employer enjoyed small credits below basic rates for a number of years, but in 1954, a punch press accident occurred which necessitated the amputation of the hand of one of the employees. That resulted in removing the credit the employer had previously enjoyed and transferred his rate into a penalty of 32¢/$100 of payroll, which meant that in 1955 this employer paid an additional premium of $500 to the State Industrial Commission as a result of that one accident.

The merit rating system in Ohio is devised in such a way that losses are charged to employers not for one year but for five years, so that this small employer with but one accident has a potential cost of $2500 to the State Industrial Commission, that might have, or could have, been prevented if safe practices had been instituted in that factory.

In addition, and much more serious, is the fact that the Constitution of Ohio has a provision, which I think will last as long as you or I live, penalizing employers who fail to provide the safety devices that are required by the Safety Code.

This penalty means that an employee who claims the employer violated the Safety Code can collect not less than 15% and not more than 50% of the amount of compensation the employee receives. An injury resulting in the loss of a hand means that approximately $10,000 will be paid to the injured workman for compensation purposes, so that a 15% penalty on $10,000 would be $1500, and a 50% penalty would be $5,000.

This represents an additional premium that the employer is required to pay to the State of Ohio, which, in turn, is paid to the injured workman as a penalty against that employer for failing to properly provide the safety devices that the Safety Code requires. Thus, the payment, for example, of $5,000 in the form of a penalty for this small employer, in addition to the penalty premiums he will have to pay constitutes a large sum of money, and cannot always be paid in one sum by a company of this size.

Here is another employer with an annual payroll of about $300,000. In 1953, one of the employees sustained a serious punch press injury. As a result of this one injury, the employer will pay approximately $1100 additional to the Industrial Commission in premiums for one year, and since the employer is charged for five years, this one accident will cost this employer $5,500 over a five-year period.

Here is an employer in the stamping industry with a comparatively bad safety record. Penalties have been invoked against this company every year since 1953 in varying amounts of 7¢, 15¢, 30¢ and 23¢/$100 of payroll for each year, based on an annual payroll of about $400,000/yr.

This employer will pay about $3,000 in additional premiums or approximately $750/yr.

Now, let's look at the bright side a little bit. Let's come now to another employer with an average annual payroll of $600,000/yr whose credit below the basic rate in 1951 was 44%. In 1952 it was 26%; 1953, 9%; 1954, 12%; 1955, 21% and in 1956, 29%. So that for six consecutive years, this one employer has enjoyed an excellent record as far as credits below basic rates were concerned.

Now, percentages don't mean a whole lot unless you translate them into dollars. The six-year record of this one employer means that he paid to the Industrial Commission during that period $22,000 less than any other stamping employer in this State with a similar payroll who only paid the basic rate.

If this same employer was penalized the same percentage as he enjoyed credit, he could have paid to the State Industrial Commission over a six-year period the sum of $44,000 more than he did.

From these examples you can readily see, I'm sure, that safety pays; it does not cost.

Now, what can you as individual employers do about it? First of all, if there are Safety Codes in your State, let's read those Codes very, very carefully and let's see that all machinery is guarded in accordance with the Code so that these serious penalty awards will not be made against you because of some defective safety device or some defect in the machinery or some other situation that might resolve itself into a penalty award.

Let's follow these safety rules or these Safety Codes diligently; let's have regular safety meetings, educate the set-up men, educate the foremen. From them, let's see that the workmen themselves are apprised of the danger of the type of work that they are doing, the importance of the safeguards which the employer spends a lot of money to buy, not only from the standpoint of Safety Codes, but because good production employees are hard to get.

When a man loses a hand in a stamping plant or in an accident, and he returns to work, you probably are going to give him a job of some kind, but he won't be able to make as much money, and what about the effect on production the day a man loses a hand in a punch press? How much production do you think you are going to get in one day or two days or three days? How many times have two or three or four men gotten up from their benches and from their seats when a man lost a hand and said, "I don't want to work here any more," and put on their hats and coats and walked out? Men who might have been on the payroll for a long time, men who are hard to replace.

What about damaged machinery? What about the money you lose when you have another employee take an injured workman to the doctor and the time spent in the doctor's offices, going back and forth? How much production are you getting from the other employee who was not injured, who had to leave his machine in order to help another employee get to the doctor for treatment, and with subsequent returns to the same doctor for additional treatment?

New employees should certainly be taught how to operate the safety devices that are provided. They should know something about the machine. It doesn't take very long and it doesn't take a lot of hard work and it doesn't take a lot of effort and it doesn't actually cost you any money. It's merely safety education in a real, down-to-earth way.

Enforce the use of safety devices. How many times have I gone into companies' places of business and noticed the safety devices lying idle while the man would be operating a press, and I would talk to the foreman and the superintendent and I'd say, "Don't you know that this man is a potential hazard to himself and the company and everybody else?" And the employer would say at times, "Well, yes, but he's been with us 15 years and he told us that he can't use those safety devices and he's never been injured before so we just let him get along that way."

Now, we buy insurance because we know that sometime or other somebody is going to have occasion to use it, and certainly, when safety devices are provided, their lack of use is not sufficient. As far as the Safety Code is concerned, an employer cannot escape the penalty in this State by saying, "I provided the safety guard but the employee refused to use it". That is not enough under the law. The employer must not only provide the safeguard but he must enforce its use.

I'm sure that any employer with a labor agreement will never have difficulty if he finds it necessary to

. . . Continued on Page 125

faster delivery

FROM YOUR LOCAL INDUSTRIAL DISTRIBUTOR'S STOCK

ACME Dowel Pins

- Standard PINS available in lengths from 3/8" to 6"—1/8" to 1" in diameter. Specials, including pins of stainless steel, quoted on request
- Precision pins, hardened and ground to .0002" or .001" over nominal diameter—also available: .002", .003", .004" and .005" oversize—all diameters .0001"
- Acme Pins are case hardened to 60-62 Rockwell "C" scale and a core hardness of 36-38
- Acme Pins will break before bending or mushrooming

Write for information and prices on standard and oversize dowel pins

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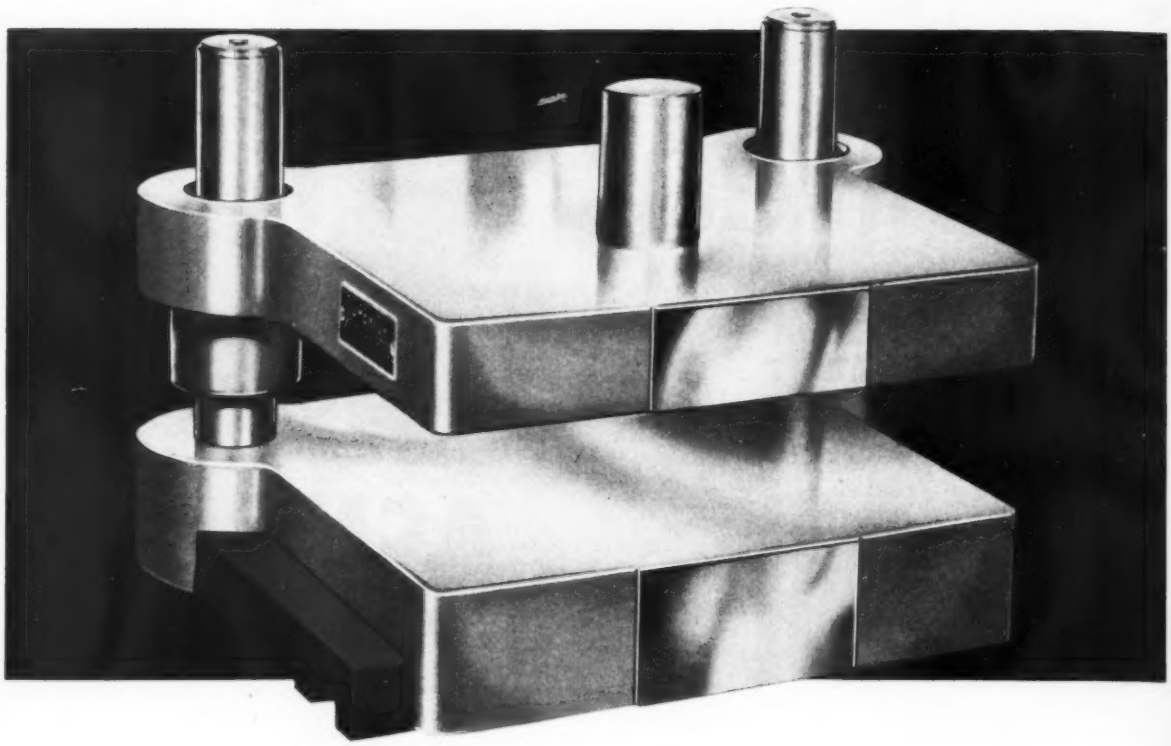
CIRCLE INFORM-A-GRAM KEY NO. 119

Only SUPERIOR offers time



Large Sets No Longer Need Be Blocked . . .
Small Sets Can Be Lifted Without Sliding.

Features exclusive with SUPERIOR DIE SETS permit rapid assembly, disassembly and overall handling of large and small die sets. In addition they provide safety insurance . . . protection for the skilled hands of die makers and handlers . . . protection also against the ruining of costly dies in handling, or even damaging of valuable press equipment.

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Write for FREE 24 page Catalog on Superior Die Sets and Supplies

CIRCLE INFORM-A-GRAM KEY NO. 120

these *Features* that save and cut die making costs

NOW all SUPERIOR die sets have

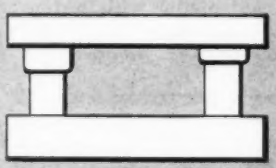
Superfinish guide pins

HIGH LUSTRE MICROFINISH (2-5 Micro Inches)

RESULTS IN

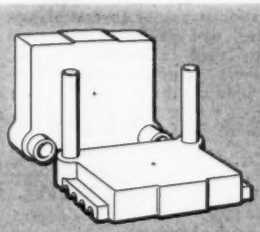
1. ***Maximum Surface Hardness***
2. ***Increased Bearing Surface***
3. ***Longer Pin and Bushing Life***
4. ***Greatly Reduces Possibility of Scoring***
5. ***SMOOoother Action***

Super Finishing, long a prerequisite in the Automotive and Aircraft Industry for precision bearing surfaces, is now a standard on Superior guide pins. With Super Finished guide pins ideal clearances can be maintained due to a greater bearing surface.

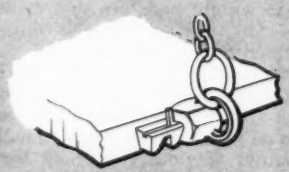


LONG and SHORT BUSHINGS
Provide greater ease and convenience in assembling. Punch holder can be raised and swung out of way in checking dies. No need to part die set. Long bushing on left side.

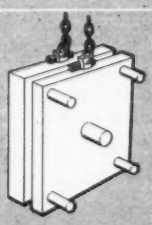
SAFETY FLANGES
Protect fingers by providing roomy gripping space on either side of the die shoe. Flanges may be mounted flush or on the edge of the die set and are welded in place. There is no extra charge for this valuable safety feature.



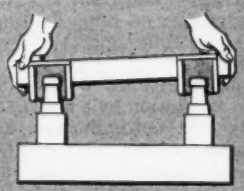
PRECISION CENTER MARKS
Eliminate guess work, speed production of dies and eliminate unnecessary handling. Marking pins leave precise center marks in both halves of the set . . . There is no need to determine centers, no chance for error.



LOCK-JAW LIFTING DEVICE
• Self-Locking • Assures Positive Safety • Permits One Man to turn large die set in matter of Minutes. No need for clamping. Cast from special Heat-Treated Alloy Steel • Simple — Safe — Easy to Use.



E-Z LIFT SLING CHAIN
Lock-Jaws attached to the sling fit quickly into place on safety flanges for immediate lifting . . . No need for "C" clamps, eye bolts, or lifting lugs.



"REMOVABLE CAP" PINS END TROUBLESOME BINDING IN PARTING DIES
Caps are Quickly and Easily Removed with Socket Wrench to Free Punch Holder Ending Excessive Time in Parting Dies.

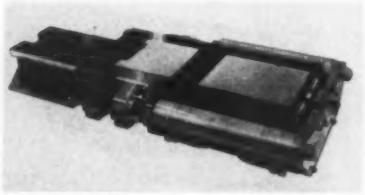
CIRCLE INFORM-A-GRAM KEY NO. 121

Special Machines

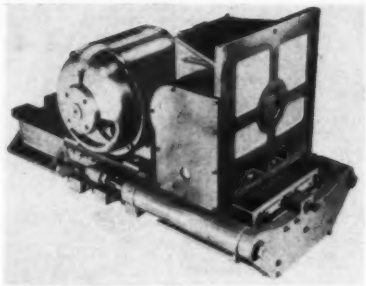
STANDARD AUTOMATION UNITS CUT COSTS

With the introduction of a complete new line of standard automation components, Baker Brothers, Inc., have eliminated much of automation's "specialness."

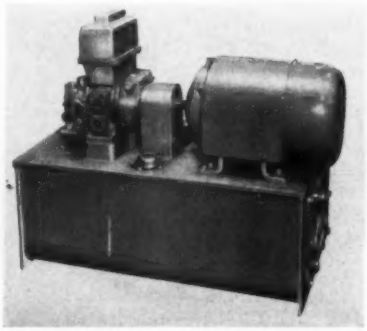
"Standardization of as many components as possible will obviously reduce the engineering and manufacturing costs of automation," according to Roland Lehr, president of Baker. Formerly the feeling encountered in the industry was that every automation machine was so different from every other one, they might as well design each one from the floor up.



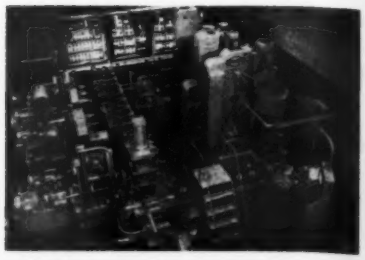
This Baker basic model 1215 hydraulic slide is one of several standard sizes and includes twin-pull hydraulic feed cylinders, saddle, ways, limit switches and switch cams. Slide can be mounted in any plane.



To the same standard bare slide shown above has been added a standard Baker 15-hp drive box.



Fully automatic transfer machine made up from standard Baker components, plus special tooling and transfer devices.



Hydraulic feed unit for the slide and drive box shown, is this optional Baker "Porta-Pak", one of two standard power sources available.

But Baker engineers analyzed past machines they had designed and asked the two-fold question, "What components of these machines could have been standardized, and how many sizes and types of standard components would have been necessary?"

The result is a complete line of standard components for Baker hydraulic machines that perform drilling, boring, facing, chamfering, tapping and other operations. These standard components include hydraulic slides, drive boxes, and power sources for hydraulic feed. Plans for the immediate future include standardization of bases, spreaders, frames, heads and index tables.

To these standard units Baker adds those components which must necessarily be specials — such as some heads and tooling. The final machines, though basically standard, are even being completely equipped for full automation with loading and unloading devices and conveyors.

NEW TRANSFER MACHINE AUTOMATICALLY FINISHES 650 PISTONS PER HOUR

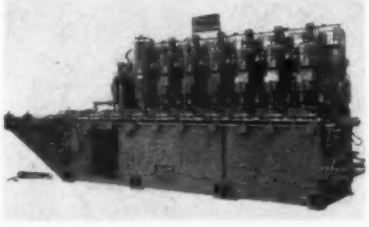
A new 11-station transfer machine has been designed and built to automatically perform nine drilling, reaming and milling operations on automotive pistons.

Pistons are delivered dome side down to the 1st station by a conveyor where they are automatically accepted and loaded into the machine. Station-to-station transfer is accomplished by hydraulically operated transfer fingers and a reciprocating transfer bar.

After transfer to the 2nd station, the piston is properly oriented in relation to pin bores and bosses by means of an electric eye and orienting table.

At the 3rd station, the piston is pushed down against a positive locator by four expanding lugs. The center of the dome is drilled and two sections of the dome are spotfaced from the bottom upwards. These are used as centering and locating points in properly positioning the pistons during the balance of the operations.

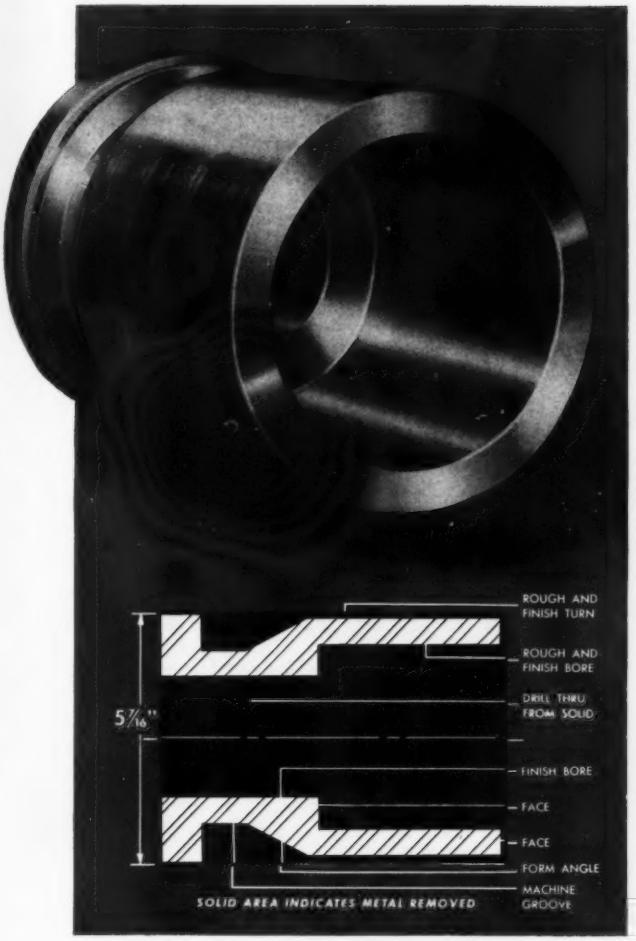
The two weight pads on the bottom of the piston — which are facing upwards in the machine — are milled at the 4th station. Drive holes in these weight pads are spot drilled at the 5th, drilled at the 6th, and reamed at the 7th stations.



At the 8th station, two oil holes are drilled through half of the pin boss. Using these holes as approaches, two oil holes are then drilled halfway through the other half of the pin boss at the 9th station. The 10th station completes the drilling through of these oil holes.

When the piston reaches the 11th and last station, chips and coolant are dumped, and the part is automatically unloaded to a conveyor.

This new Motch and Merryweather inline transfer machine is capable of automatically machining 650 pistons/hr at 100% efficiency.



Let me show you how one of our P & J Automatics

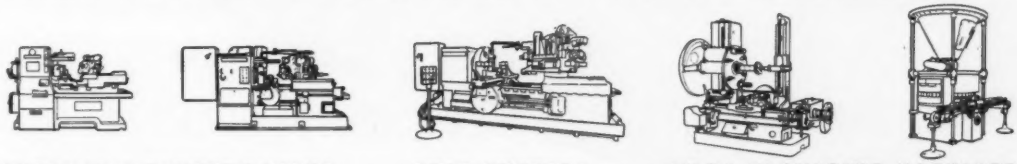
Hogged Out Over

31 POUNDS OF STEEL IN 6¾ MINUTES!

This job looked really tough. Machining from the solid meant unusually heavy metal removal . . . and our customer had to hold some pretty close tolerances and turn out parts *fast*! Here's what did the trick! Our new P&J Automatics have the extra power it takes to hog out metal fast *and* the extra rigidity that's needed to stay within the required limits under the heaviest feeds. You can see how teaming a machine like this with P&J Tooling, to save even more time by combining cuts, made it possible to complete one of these spools every 11 minutes. A new P&J Automatic can bring performance like this into your plant too. Send me your sample prints, and I'll show you how a P&J Automatic with P&J Tooling can help you turn out your toughest jobs faster, better and at lower cost. Write to Potter & Johnston Company, Pawtucket, Rhode Island.

HERE ARE THE FACTS:

PART: *Chuck Operating Spool.*
MATERIAL: *Cut-Off Bar Stock #34 Carbon Steel.*
REQUIRED: *Machine from the solid. Ten separate precision cuts.*
RESULTS: *A part completed every 11 minutes in a single, fully automatic cycle, removing a total of 40 pounds of metal.*
MACHINE: *P & J Model 6DRE-40.*



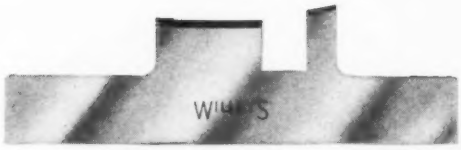
AUTOMATIC TURRET LATHES . . . GEAR CUTTERS . . . GILDA PACKAGING MACHINES

POTTER & JOHNSTON

SUBSIDIARY OF PRATT & WHITNEY COMPANY, INC.

PRECISION PRODUCTION TOOLING SINCE 1898

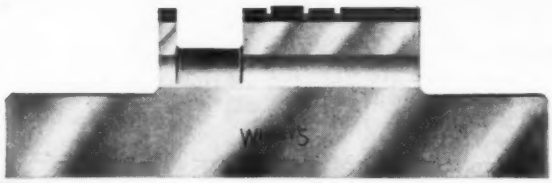
CIRCLE INFORM-A-GRAM KEY NO. 123



WILLEY'S CARBIDE WORK SUPPORT BLADES FOR CENTERLESS GRINDERS

FROM STOCK standards & specials

Thru-Feed • In-Feed • Long-Bar
Tube & Rod • Roller In-Feed
Race • Power Race
Heavy Duty



WORK SUPPORT BLADES

for special application

Willey's have pioneered in the development and manufacture of carbide work support blades. Seasoned toolmakers with "know-how" build these tools for standard as well as for special applications. Many centerless grinding operations require special carbide tipped work support blades for work such as: multi-diameter—angular—form—tapered or radius grinding.

Write for complete illustrated catalog and price list

RECONDITIONING SERVICE

Willey's regrind or carbide re-tip your worn out, chipped, broken or damaged work support blades to original accuracy . . . smooth—straight and parallel. For more than 20 years Willey's customers have used this service, often having the same blade reconditioned many times . . . a service and savings available to you too.

WILLEY'S CARBIDE TOOL COMPANY

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CIRCLE INFORM-A-GRAM KEY NO. 124

. . . Safety from Page 118

send a man home in the form of a penalty for a day or two days or three days because of his refusal to use the safety devices that are provided for his use by Management.

I think that employers generally should maintain good housekeeping. I'm talking about painting the aisles, keeping debris and material away from the aisles, seeing that oil does not get on the floors. Good housekeeping is just as important in your plant as it is in your home.

See that danger zones on your machines are painted. Have regular meetings. See that there are always access areas in and out of important places. Don't stack your material too high.

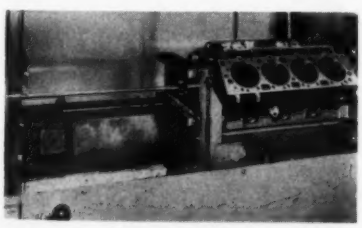
There are virtually hundreds and hundreds of things that Management can do in the prevention of accidents, that will cost you little or practically nothing at all in dollars and cents; and, yet, look at the terrific savings you can get as evidenced by the last example I gave you of an employer who saved $22,000 in a six-year period by practicing safety in his plant.

There is no question about it that "safety pays; it does not cost money."

CARBIDE DRILL USED ON DEEP OIL HOLE DRILLING IN CAST IRON

Pictured is a Starbore drill making a 9/16" dia, 20" long oil gallery hole in a cast iron automotive engine cylinder block in 80 sec.

This drill has a grade CA-4 carbide tip of 9/16" made by the Carmet Division of Allegheny Ludlum Steel Corporation. The drill, which is

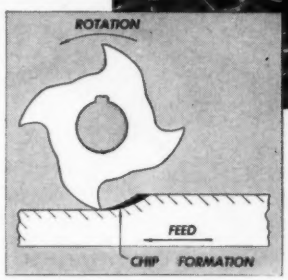


guided by a hardened steel bushing is rotated at a speed of 1700 rpm and fed at a rate of 15"/min. The operation is performed on a special horizontal boring machine using 500-psi coolant pressure. The Starbore drill is made by Star Cutter Company.

This drilling is being done on an experimental basis at the present time, but should this method be used in production it would eliminate a number of stations in the drilling of such holes.

Brown & Sharpe CHIPS

How Cutter Chips Prove Milling Efficiency!



In conventional (up) milling, work is fed against direction of cutter rotation. Chip is thin at initial engagement of tooth, reaches maximum thickness at point where tooth ends upward travel through work-piece.

High Speed Steel Cutters . . . Key to Economy

Long, unbroken chips prove that the Brown & Sharpe helical plain milling cutter is the right one for the job. An incorrectly designed cutter causes broken, uneven chips, a rough surface finish.

Correct rake angle is very important for superior finish . . . rapid machining with less power . . . increased cutter life. Every Brown & Sharpe PRODUCTIONEERED Cutter is designed with the rake angle found best for fast, economical milling.

There's a big difference between *price* and *cost* of high speed steel cutters. *True Cutter cost* is measured by how many accurate, uniform pieces are produced—at optimum speed—before the cutter requires resharpening. For maximum production, minimum cost, specify Brown & Sharpe PRODUCTIONEERED Cutters!

Write for 80 page Brown & Sharpe Catalog showing over 2300 High Speed Steel Tools and Accessories.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Brown & Sharpe

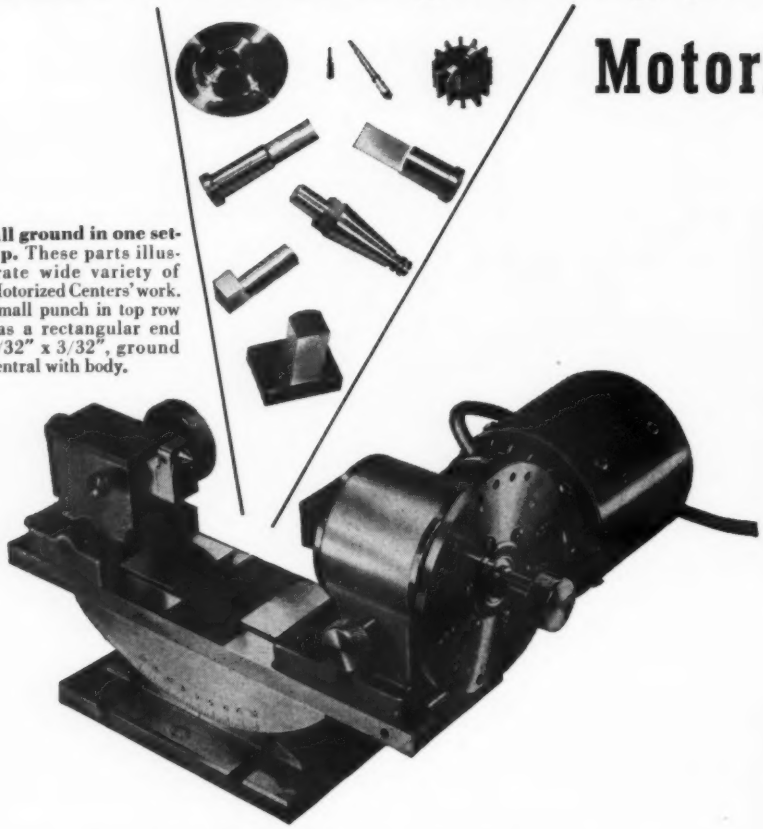
BROWN & SHARPE MFG. CO. • PROVIDENCE 1, RHODE ISLAND

STOCK OF OVER 3000 STANDARD TOOLS!

Obtain impartial High Speed Steel, Carbide and Carbide Tipped tooling recommendations from your Brown & Sharpe—NELCO Distributor.

CIRCLE INFORM-A-GRAM KEY NO. 125

Save on small grinding jobs with Moore Motorized Centers



All ground in one set-up. These parts illustrate wide variety of Motorized Centers' work. Small punch in top row has a rectangular end 1/32" x 3/32", ground central with body.

New toolroom attachment for surface grinders, jig borers, drill presses, millers, etc., handles flat, curved or circular work in one setting.

You'll wonder how you ever got along without this portable, precision-built grinding accessory. No longer is it necessary to tie up large, expensive machines to grind square and round punches...do taper grinding, index grinding and faceplate work.

Motorized Centers can be set on a surface grinder chuck in a jiffy and the job completed quicker than the grinding wheel on a large machine can be changed. Think of the resulting savings in costly toolroom labor and materials.

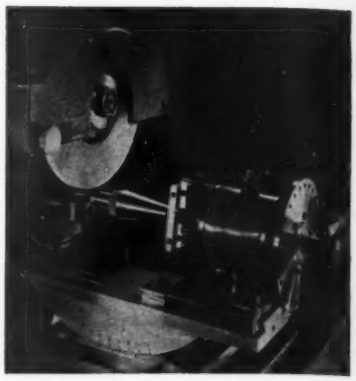
With it, in one setting, you can now grind flat, curved or circular work—in any combination of taper or contour—all within .0005". The index plate allows indexing in the same operation, too. Tapers can be reversed or changed by loosening two screws in the rocking bed, and the index plate can be engaged by merely pressing a plunger. The simple tail-stock center readily permits the use of specials—male, female or cutaway.

CATALOG WITH 20 ACTION PHOTOGRAPHS will show you graphically how you can use this versatile tool for production and inspection, too. In it are examples of some of the many difficult toolroom jobs you can handle easily: double tapers, equally spaced slots, small cylindrically tapered punches and many others. It's yours for the asking.

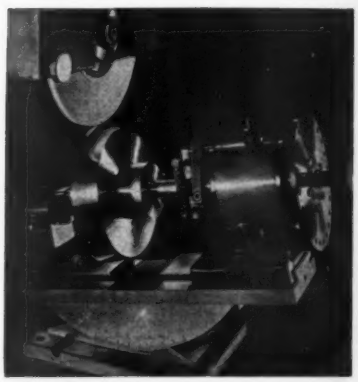
SPECIFICATIONS

Length—overall	12"
Width—including motor	10"
Height—overall	8"
Distance between centers—maximum	6"
Centers will swing	6"
Maximum grinding angle (using 10° angle block)	30°
Motor	1/25 H.P., 115 volt, 60 cycle

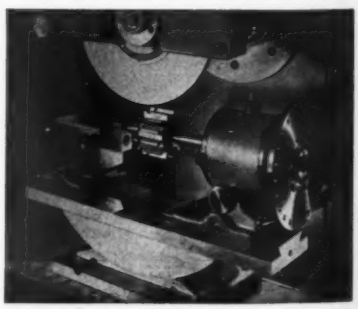
MOORE SPECIAL TOOL COMPANY, INC.
726 Union Avenue, Bridgeport 7, Conn.



Double tapers and hex shoulder ground with a single set-up. Rocking bed is equipped with a tangential screw for fine-setting taper angles.



Grinding a 10° taper on a machine part 5" long, 5" in diameter on centers.



12 equally spaced slots in punch holder ground by using index plate.

At Your SERVICE

Pittsburgh Commercial Heat Treating Co. of Pittsburgh has specialized equipment for the heat treatment and processing of all types of metals. Among its services are annealing, normalizing, stress relieving, hardening, cyaniding, and nitriding. Also performed are case, flame, and induction hardening; chapmanizing; brazing; plating; and heat treatment of tools and dies.

•

Services for steel plate fabricating and warehousing are provided by McGregor-Michigan Corp. of Detroit. The company fabricates equipment for steel mills and for miscellaneous industrial use such as engine beds, machine bases, and furnace casings.

•

To provide industry with an efficient method of checking and calibrating gage blocks, the new Eli Whitney Metrology Laboratory of The Sheffield Corp., Dayton, Ohio, is making available a comprehensive contract service. The new system for checking gage blocks assures precision measurements in manufacturing. The laboratory is equipped to calibrate all types of gage blocks to light-wave standards of precision. Formerly manufacturers had to rely on the U. S. Bureau of Standards to assist them in preserving dimensional accuracy.

•

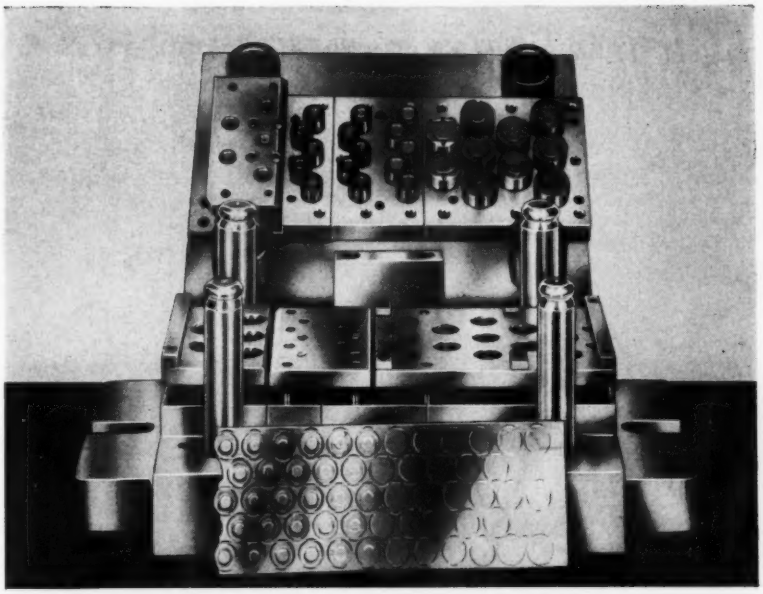
Blanking and piercing dies are manufactured by Scottish Tool, Die & Metal Products Co. of Cleveland. The Scottish system enables use of one die set for many different dies, thereby cutting production costs. The firm supplies dies from ½" x ½" to 36" x 120" in almost limitless contours and punch patterns.

•

Standard Die Set Manufacturers, Inc., Providence, R. I., has expanded its stress relieving facilities by installing annealing furnaces in Philadelphia and Indianapolis. They supplement the large furnace which has been in service in the main plant. The company's process removes residual stresses and insures maximum stability of the punch and die holders. When secondary machining is required, secondary stress relieving is employed to further stabilize the steel.

•

The completely integrated data processing, computing, and data reduction service firm, The Datics Corp., has opened a Dallas district office. In addition, the company has announced that a contract has been signed with International Business Machines Corp. for the 705 electronic data processing machine, the largest IBM computer in operation.



Carbide Dies Outlast Steel 55 to 1 . . .

PROMINENT MANUFACTURER REDUCES COSTS, CUTS DOWN-TIME, INCREASES OUTPUT

One of the country's best known manufacturers was using steel dies to produce metal tops for flashlight batteries. After running only about 200,000 pieces, these dies required a complete reworking. In an effort to reduce the time and money wasted by this lengthy maintenance period, the manufacturer decided to investigate carbide dies.

CARBIDE SPECIALIST CALLED IN

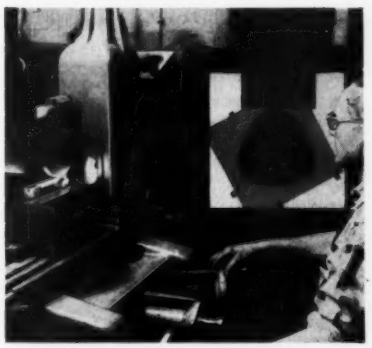
Jaquith Carbide . . . a specialist in the design, manufacture and application of carbide dies . . . was asked to furnish quotations on the initial cost of carbide dies and to estimate probable production increases and cost reductions. These estimates showed that an investment in carbide could pay important dividends, so Jaquith was asked to design and produce carbide dies to do the job.

CARBIDE GOES TO WORK

On the job, the Jaquith Carbide Dies produced *eleven million* pieces before requiring maintenance! While the initial cost of the carbide dies was nearly twice that of steel, this extra investment has paid for itself many times over in far lower long-run die costs, drastically reduced maintenance costs and greatly increased production rates.

A TYPICAL CASE HISTORY

This successful application of carbide dies to the production of battery tops is *typical* of the many instances where a switch to carbide dies has produced *big* savings in time and money. Since they outlast steel by as much as 10 to 100 times, carbide dies offer important advantages *wherever* long production runs, close tolerances or abrasive materials are involved.



CHOOSING THE RIGHT SOURCE

Designing, engineering and producing the *right* carbide die for your operations takes trained specialists working with advanced equipment. At Jaquith, you will find every department manned by skilled, experienced craftsmen . . . like the master die maker shown here precision forming a complex draw die on one of our modern visual form grinders. Here at Jaquith, we have the ability and facilities to take a problem right through from parts print of product to finished, ready-to-run die. Send us *your* prints or production drawings and we will show you how Jaquith Carbide Dies can help you increase output and reduce costs. *Write to Jaquith Carbide Division, 15 Stewart Street, Lynn Massachusetts. LYnn 8-9754.*

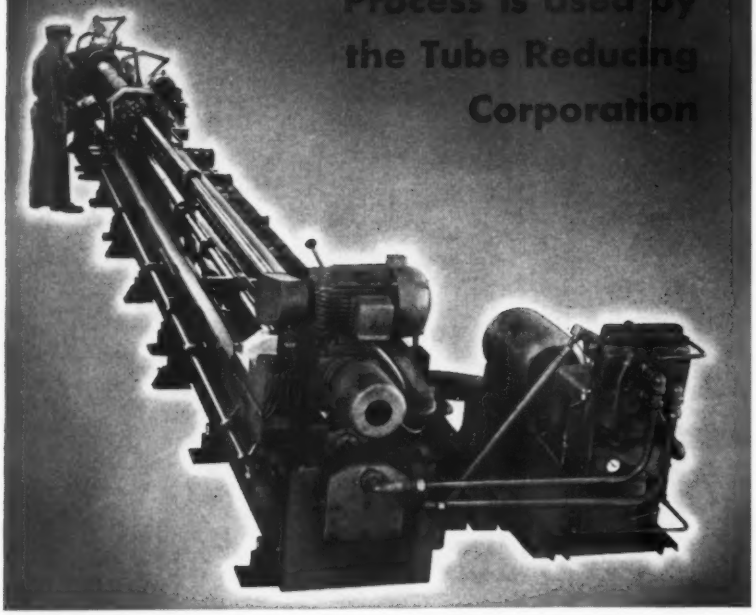
JAQUITH CARBIDE

DIVISION OF PRATT & WHITNEY COMPANY, INC.

SPECIAL DIES • COLD HEADER PARTS • WEAR PARTS

CIRCLE INFORM-A-GRAM KEY NO. 127

Why MICROHONING Process is Used by the Tube Reducing Corporation



The carbon steel, stainless steel, alloy steel and non-ferrous tubes manufactured by the Tube Reducing Corporation are used on applications that require high strength, uniform wall thickness and surfaces free of pits, scratches or other imperfections.

In processing its tubes, Tube Reducing uses Microhoning, either to prepare the tubing for its exclusive "Rockrite" process, or to generate functional characteristics in finished tubing.

As a preparatory operation—which produces a round, straight bore and a clean-cut, cross-hatch surface pattern—Microhoning helps to improve the results of "Rockriting." The Microhoned surface slides easily over the "rocking" mandrel and compresses to a smooth, flaw-free surface that passes the most rigid inspection and tests.

Other "Rockrite" tubes, used in such applications as hydraulic cylinders, are Microhoned after "rocking" to generate final bore size and geometric accuracy.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision"... available at your request.

☐ Please send me "Progress in Precision" in time for showing on _____(date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____F
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE ____ STATE _____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 128

BOOK REVIEWS

BEARING DESIGN AND APPLICATION, by Donald F. Wilcock and E. R. Booser. Published by McGraw-Hill Book Co., 327 W. 41 St., New York 36, N. Y., 1957. 470 pages, 225 illustrations, $12.50.

This new book gives the machine designer practical information on the selection and design of bearings and their lubrication. Based mainly on the authors' experience during the last 10 years in bearing designs for electrical apparatus, household appliances, instruments, and aircraft units, the book covers the subject from three aspects: design, including bearing geometry, general configuration, and tolerances; materials from which working parts of bearings are made; and bearing lubricants. Rolling element bearings, slider bearings (both journal and thrust), bearing materials, and troubleshooting are covered.

IMPROVING HUMAN RELATIONS, a booklet by the NAM Advisory Group on Improving Human Relations in Industry. Published by the Industrial Relations Division, National Association of Manufacturers, 2 E. 48 St., New York 17, N. Y., 1956. 32 pages, $.50.

In this booklet the NAM presents an action program designed to help top management develop better supervisor-employee relations in the plant, and thus step up productivity. It emphasizes that the supervisor, as a member of management, must "listen" to employees and understand their needs and wants. It points up the possibilities of getting cooperation and building good work habits through the wise use of praise (not flattery) and urges genuine interest in employees as individuals, apart from their function as producers.

AUTOMATION IN BUSINESS AND INDUSTRY, edited by Eugene M. Grabbe. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 1957. 612 pages, $10.

The book is based on a series of lectures given by a number of prominent engineers and scientists at the University of California. They include L. M. K. Boelter, dean of the College of Engineering at the University of California; Simon Ramo, executive vice president of The Ramo-Wooldridge Corp.; John L. Barnes, president of Systems Laboratories Corp.; Harold Chestnut, proj-

ect engineer for General Electric Co.; John L. Bower, engineering specialist, Autonetics, North American Aviation, Inc., and 14 others.

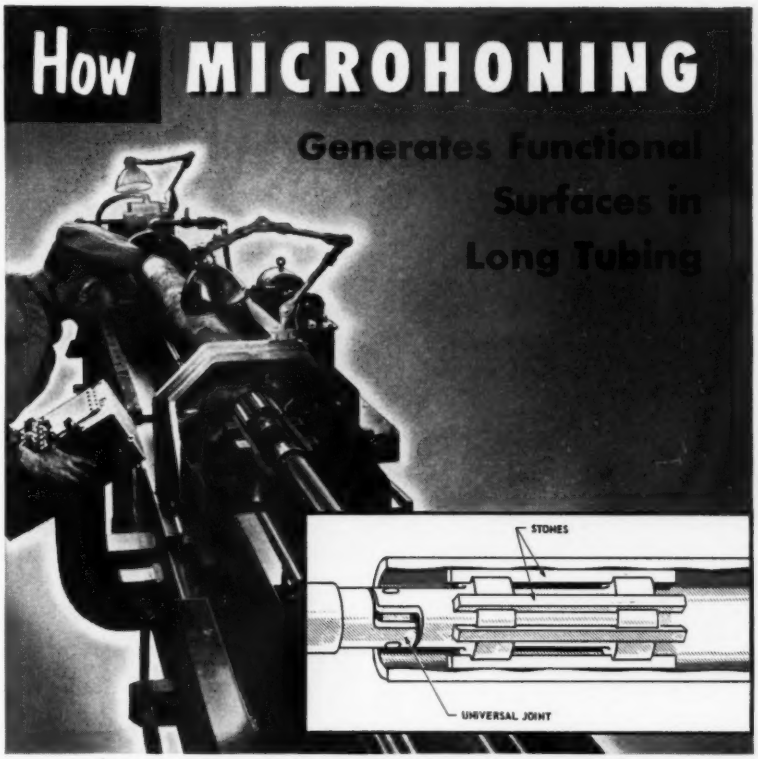
They show how the fields of feedback control theory, instrumentation, analog and digital computation, and data processing are now becoming integrated as automation is applied on a broad scale to control systems which encompass the range from top management to individual machines. Emphasis is placed on those applications of control systems which can perform both complex control functions and data processing.

CAMS — DESIGN, DYNAMICS, AND ACCURACY, by Harold A. Rothbart. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 1956. 350 pages, $9.50.

The author, a member of the Mechanical Engineering Department of The City College of New York and a consulting engineer, wrote this book especially for designers concerned with creating a mathematical function, motion, mechanism, machine, or mechanical computer. It is a significant extension of the kinematic approach to cam action. Practical recommendations are given concerning topics such as mass acceleration, materials, and the type of cam followers to be used. A special section deals with profile accuracy and errors. Individual chapters include discussions of basic curves; cam size determination; cam profile determination; advanced curves; polydyne cams; dynamics of high-speed cam systems; force analysis; surface materials, stresses, and accuracy; and special cams and their applications.

CHANGING PATTERNS AND CONCEPTS IN MANAGEMENT. Published by the American Management Association, 1515 Broadway, New York 36, N. Y., 1956. 55 pages, $1.75 (AMA members: $1).

To clarify new trends in management thinking, this AMA publication presents a useful theory of management based on the integration of motivation research with existing theories of scientific management. Insights obtained from research in leadership, performance goals, and other motivational factors are applied to all company functions to form more harmonious patterns of operations. Executives of some of the country's leading businesses discuss this subject and other recent management developments in the bulletin. Reports on organizational planning dealing with basic considerations and the human element in successful planning are also included, along with a section on the prospects for management growth in the next 10 years.



Microhoning is used by the Tube Reducing Corporation in processing many types of tubing that range up to 18 feet long and 9½ inches in diameter. The tubes are Microhoned on a horizontal Hydrohoner equipped with a hydraulic clamping fixture that is easily adjusted to handle tubes of various sizes.

Microhoning tools have long abrasive sticks which cannot follow irregularities in the bore. The abrasive action removes high spots while generating required surface characteristics and accurate geometry. A universal joint, connecting the tool body to the drive shaft, eliminates any tendency of abrasive action to change the bore location.

Typical processing of "Rockrite" tubes: To remove scale and deep scratches . . . hot rolled, pierced billets are first bored. Then, the bores are Microhoned—stock removal rate is .015 inch from a 4½-inch diameter x 128-inch length in less than 30 minutes. The Microhoning operation generates accurate, round, straight surfaces with the required finishes of 20 to 30 microinches r. m. s.

Send coupon for complete information.

Learn how Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____F

TITLE_____

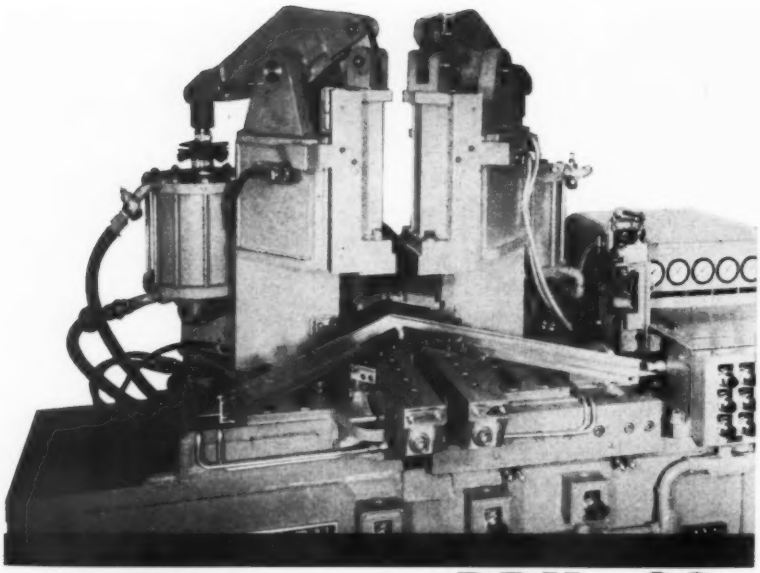
COMPANY_____

STREET_____

CITY_____ZONE_____STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 129



Darwin

PRK • 33 TOOL STEEL

(Cobalt, High Carbon, High Chrome)

***Holds its edge at 1000° F.!**

Above is the Thomson Synchro-Matic Welder performing a miter weld on an aluminum window extrusion. "Pinch-off" dies of PRK-33, a Thomson development, support the work close to the point of weld. After welding, this PRK-33 die moves in to pinch off the flash close to the surface of the work. Eliminates most cleaning and finishing of the weld.

After testing many die steels, Thomson now specifies PRK-33. They have found PRK-33 to be the finest high carbon, high chrome, with cobalt, die steel available. Its production record, its ability to hold a hard edge at high temperatures far surpassed all other die steels tested. Heat treated and double drawn at 980°F. gives PRK-33 a secondary hardness of 59-61 Rc.

Want these qualities in the dies you buy?—Write for full information NOW!

Complete Line of highest grade Tool Steels, including PRK-33, DARWIN No. 1, NEOR, MINEOR, OHT, "MT6" and various grades of Hot Work Specialty Steels. Furnished in Bar Stock, Forgings, and Sand Castings, Drill Rod, Flat Ground Stock and Tool Bits.

Bulletin on Request.

DARWIN & MILNER Inc.

highest grade tool steels

2345 ST. CLAIR AVENUE ★ CLEVELAND 14, OHIO

• 1610 W. FIRST AVENUE • COLUMBUS, OHIO •

REPRESENTED BY

ZIV STEEL & WIRE CO., CHICAGO • DETROIT • ST. LOUIS • INDIANAPOLIS • TOLEDO • MILWAUKEE • M. G. OPP COMPANY, NEW YORK CITY • PECK STEEL & DIE SUPPLY COMPANY, LOS ANGELES • CHARLES B. WEBSTER, PLAINVILLE, CONNECTICUT • CHARLES W. BRINGMAN, ORLANDO, FLORIDA

CIRCLE INFORM-A-GRAM KEY NO. 130

FILMS TO SEE

"Piercing the Unknown" explains how "electronic brains" are freeing the human mind for creative thinking. It demonstrates how the electronic calculating machines produced by International Business Machines Corp. are removing the time barrier to scientific progress. The 22 min, 16 mm sound and color film is available on a free loan basis from Modern Talking Picture Service, Inc., 3 E. 54th St., New York 22.

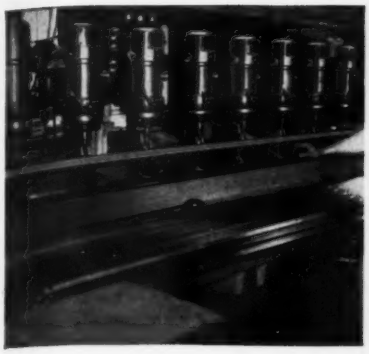
Industrial grinding wheel users will be interested in the film, "How to Select the Right Grinding Wheel." It explains the meaning of typical grinding wheel markings and shows the different variations of each unit symbol. Grinding wheel specifications are developed step-by-step for two different and specific grinding jobs. The 16 mm film is loaned by Norton Co., Worcester 6, Mass.

Short run stamping methods and facilities are described in a new color and sound film introduced by Federal Tool & Mfg. Co., 3600 Alabama Ave., Minneapolis 16. "Short Run Stampings at Federal" shows the various methods of producing short run stampings, their uses in various industries, and typical types of stampings and materials. The film is about 10 min long.

"Modern Methods for Joining Metals" shows a variety of welding processes and applications in a non-technical manner. It illustrates the importance of the welding engineer in industry. In addition, it presents the many factors involved in electric welding, and how research, development, and engineering serve to provide increasingly better methods and equipment. Arrangements to see this 20-min sound and color movie can be made by contacting Linde Air Products Co., Div'n of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17.

A sound film is now available showing how Burgmaster turret drills are made and how they operate. Included is the complete sequence of operation of the new positioning table with electronic control. Film action shows how the control tape is made and follows the resultant automatic operation of the spindles. Direct requests for the 16 mm film, which runs 25 min, to Burg Tool Mfg. Co., Inc., 15001 S. Figueroa St., Gardena, Calif.

A catalog listing available films has been prepared by Bethlehem Steel Co. Sixteen movies are described, which are loaned free of charge by Modern Talking Picture Service, Inc. Obtain copies of the film catalog, Booklet 426, from Bethlehem Steel Co., Bethlehem, Pa.



NEW Drill Set-Up Cuts 5-Day's Production to 5 Hours

Part of the production operation for the Western Patio Door Co., Berkley, California, is the drilling of eight holes in extruded aluminum sides for glass patio doors. By drilling one hole at a time and indexing the part eight times, 1200 pieces were produced in five eight-hour days. In an attempt to speed up this operation, and thereby cut costs, the set-up as shown was suggested.

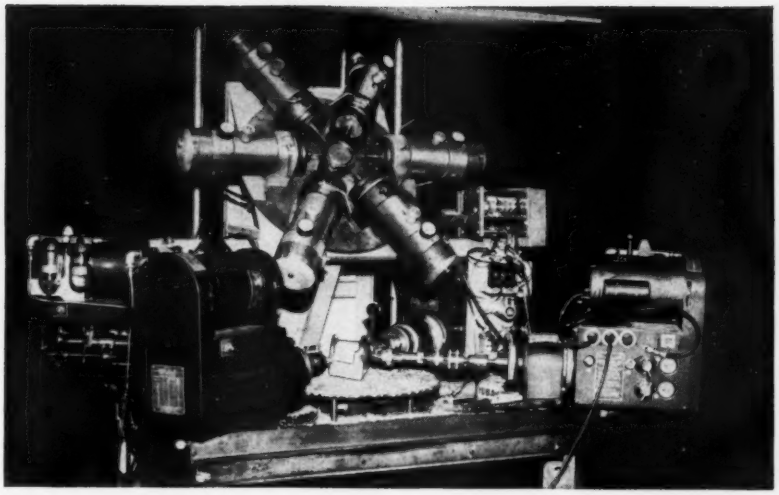
Set-Up

Now, the parts are fed to the operator on a slanted track-way under the new drilling machine. Pieces are then hand loaded and clamped into position. The operator actuates the machine by pressing one starter button. Eight heads with #38 drills then produce eight 3/16" blind holes in the part simultaneously in a matter of seconds.

This manufacturer now gets four of these parts drilled per minute. This includes loading, drilling, unloading and stacking finished parts. 1200 sides are completed in five hours, whereas it formerly required five eight-hour days. The time savings resulted in a substantial reduction in the production costs on this operation.

Drill Head Type

The drill head used for this unique machine is the Dumore Series 20 Automatic Drill Head. It utilizes the "resistance drilling" technique which permits the workpiece to determine the rate of drill feed and speed. Built-in controls practically eliminate drill breakage and scrap losses. It automatically maintains the correct feed pressure, pre-selected drilling depth accurate to .004" and the right drill speed for type of work. This compact, easy to mount tool is ideal for high production drilling of small parts. No. 80 to 5/32" drill capacity. For further information on this and other Dumore precision tools, write to The Dumore Company, 1304 Seventeenth Street, Racine, Wisconsin. *ADV.*



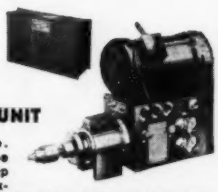
Standard DUMORE Components Make Special Production Machines . . .

for Quick, Low-Cost AUTOMATION

Presto Line Corp., Los Angeles, uses three types of Dumore standard components. These inexpensive precision tools are easily arranged in the set-up as shown. On it, zinc die castings are recessed, tapped and drilled in one continuous operation handled by one man. From 260 to 300 pieces per hour flow through this set-up with *no scrap losses.*

Two Dumore Series 24 Units are mounted on the work table with simple standard nose brackets, one on the right corner and the other opposite. These recess both ends of castings simultaneously. On the other two corners are two Dumore Series 28 Units which tap both ends simultaneously, after castings index automatically from recessing position. The operator then places the workpieces on the fixture above, consisting of six Dumore Series 20 Units which drill six 3/32" holes at once.

By using Dumore standard components, this manufacturer gained quick, precision automation at low initial machine cost.



NEW Series 28 AUTOMATIC "DRILL-N-TAP" UNIT

Two tools in one. Drills or taps at the flip of a switch. Tap fits into chuck, no extra head required. For long or short runs. Reversing motor removes tap, eliminates expensive clutches. Spindle speeds 765 to 4900 rpm. Mounts anywhere with simple nose bracket attachment.

Series 24 AUTOMATIC DRILL UNIT

All controls built-in. For production runs with varying conditions and frequent changeovers — single or multi-unit operations. Variable speeds, feeds, depths. Nose mounting bracket, Hydraulic Feed Control and chip breaking accessories available.

Series 20 AUTOMATIC DRILL HEAD

Economical, dependable unit for small parts drilling. Built-in controls. No. 80 to 5/32" drill capacity.

Get the facts on how Dumore automatic standard components can give you low cost precision automation for your work. Ask your distributor for details, or write . . .

YOU CAN DO MORE WITH DUMORE DRILL UNITS

DRILLING • TAPPING • BORING • MILLING • FACING • REAMING • CHAMFERING • DEBURRING

DUMORE®

PRECISION TOOLS

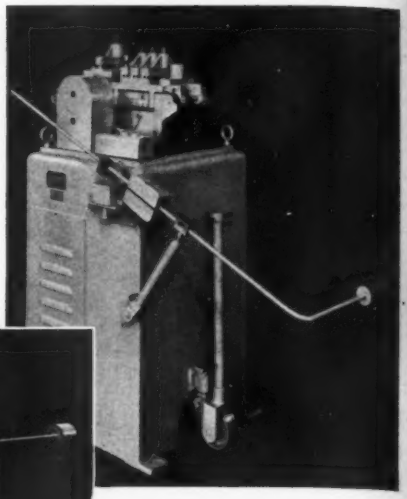
1304 Seventeenth Street, Racine, Wisconsin

AUTOMATIC DRILL UNITS
TOOL POST and
HAND GRINDERS

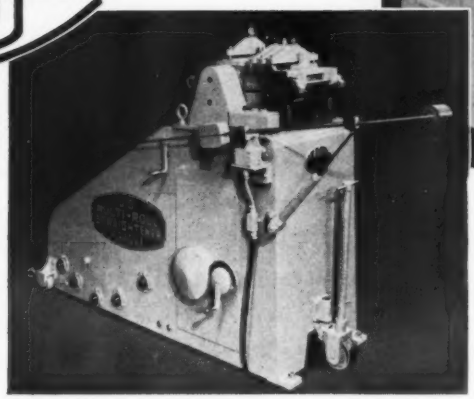
CIRCLE INFORM-A-GRAM KEY NO. 131

USE U·S PRODUCTS ★

REDUCE PRESS ROOM COSTS



Right: Model PDS-4½ U. S. Power Driven Straightener (portable type) for material up to 4½" wide, ⅛" thick. Equipped with ½ HP variable speed drive motor. Also made in other sizes.

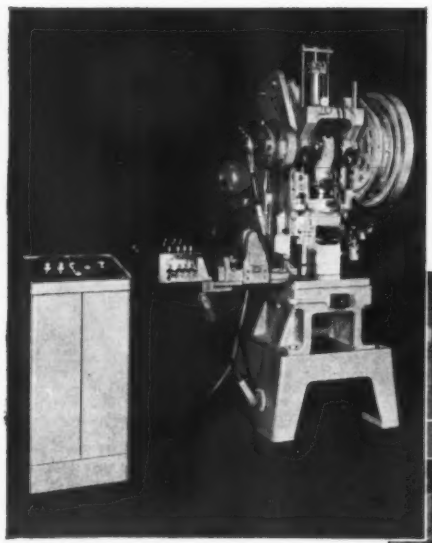


Left: Model PDS-940 U. S. Combination Coil Cradle and Power Driven Straightener (portable type) for material up to 9" wide, ⅛" thick, coils with OD up to 40". Includes 2 HP variable speed drive motor. Also made in other sizes.

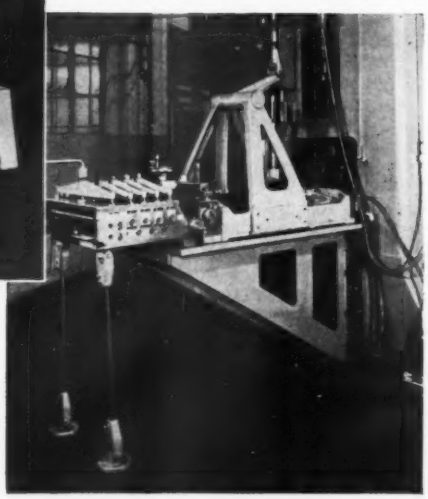
Don't allow inefficient operations to devour your profit margin. U.S. Automatic Press Room Equipment is designed and built to help you effect savings in the production of stampings.

The use of coil stock in your punch press operations should result in very definite savings, and these savings can only be completely assured by using automatic equipment in conjunction with your presses. The illustrations show just a few of the many different units included in the U.S. line for the efficient feeding, straightening and holding of coil stock.

Investigate to see if you are effecting all the cost reductions possible. Ask for a copy of Bulletin 80-P.



Above: Model SF-12 U. S. Mechanically Driven Slide Feed with Plain Straightener for material up to 4½" wide. Shown mounted on a Minster B1-32 High Speed Gap Press.



Left: Model SF-24-24 U. S. Mechanically Driven Slide Feed with Plain Straightener for material up to 24" wide. Shown mounted on a Straight Side Press.

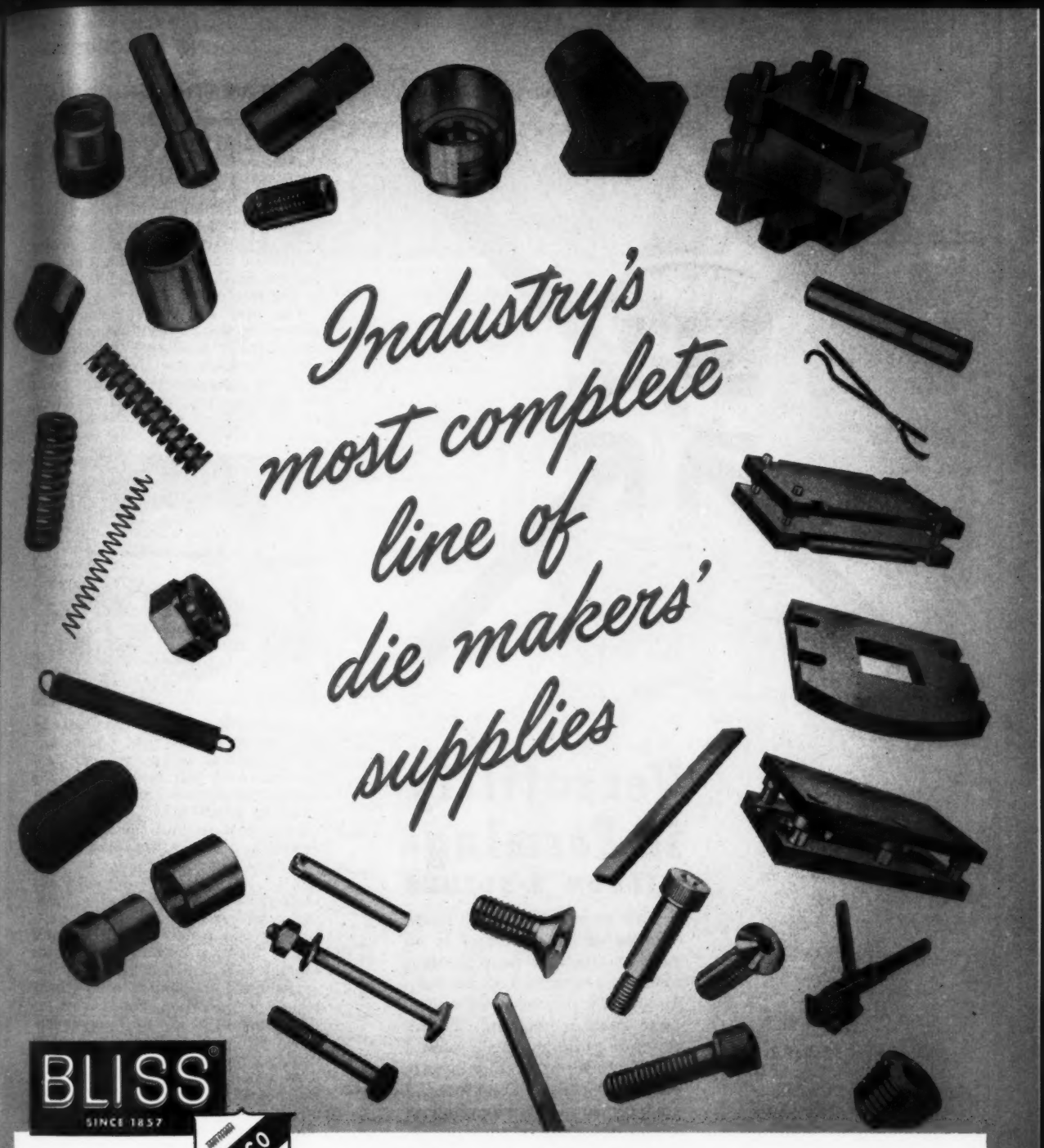
U. S. TOOL COMPANY, INC.

AMPERE (East Orange) NEW JERSEY

★ **U. S. PRODUCTS**

Slide Feeds
Roll Feeds
Stock Straighteners
Stock Reels
Stock Oilers
Coil Cradles
Wire Straighteners
Die Sets
Multi-Slides ®
Multi-Millers ®

CIRCLE INFORM-A-GRAM KEY NO. 132



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Write for your copy of our new catalog. Ask for No. 70-A

Versatility in Forming-

NILSON 4-SLIDES

Simple or complex metal forms in wire or ribbon metal is no problem on a Nilson. Tooling for basic forming can be augmented by provision for operations such as welding, assembling or swaging. Open design on all forming elements provides for quick tool change and easy adjustment even from wire to metal forming on the one machine that does so many jobs so well. The universal Nilson 4-Slide is the economical answer to your forming problems. Size ranges—wire up to ½" dia. in feeds to 32" max., ribbon stock up to 3½" wide. 5 to 75 ton press sections. Our specialists can assist you in all types of forming requirements.

THE A. H. NILSON MACHINE CO.
1522 BRIDGEPORT AVE. • SHELTON, CONN.

NILSON

CIRCLE INFORM-A-GRAM KEY NO. 134

AUTOMATIC GRINDING SETUP FINISHES 385 CLUTCH CONES 1 HOUR

Taking advantage of many automatic features built into modern surface grinding machines, a major automatic transmission plant is turning out finish machined clutch cones at the rate of 385/hr.

The only manual operation performed on this rotary automatic surface grinder, built by Mattison Machine Works, is the loading of work into the machine. From this point on, all functions, including unloading of the finished work, are designed into the machine.

Loading of the steel clutch cone by the operator does not require any special skill as an approximate positioning is all that is required. The part is positioned and clamped for grinding when the clamping finger moves forward and holds the part against a notch on the inner ring of the work table.

Work is unloaded automatically after it has passed under the finishing head. A cam releases the part-holding clamp and the fork located below the part-holding fixture tilts to slide the finished part into the exit chute. This fixture is extremely simple in operation, eliminating the possibility of requiring either maintenance or adjustment as a more complex unit might.

Automatic safeguards built into the machine include an electrically operated switch on the grinding wheel that shuts down the machine if a part is clamped improperly. Stock removal is 0.010 to 0.015" on one side in a single pass through the machine. Automatic sizing is provided at both the roughing and finishing wheels.

TECHNICAL BOOKS ARE AVAILABLE
SEE THE HUEBNER PUBLICATIONS ADS ON PAGES 136 AND 224.

— SAVE THIS AD FOR FUTURE REQUIREMENTS — DEALERS INQUIRIES INVITED

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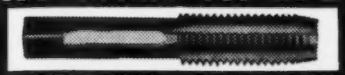

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New sizes added daily • • • If not listed hereon inquire

RIGHT HAND TAPS

Size	Threads Per Inch
00	90-96
0	56-64-72
1	56
2	60-72
3	40-60-64
4	32-42-44-56-60-64
5	30-32-36-48-56-80
6	30-36-38-42-44-48-56-60-64
7	28-30-32-34-36-38-40
8	24-26-30-38-40-44-48-56-60-64-80
9	24-28-30-32-40
10	18-20-22-26-28-30-36-40-48-56-64
11	20-22-24-28-30
12	20-22-26-27-30-32-36-38-40-48-56
13	20-22-24-32
14	16-18-26-28-30-32
15	18-20-24
16	16-18-20-22-24
17	16-20
18	16-18-20-24
19	18-20
20	16-18-20-24-32
22	16
24	14-16-18-22-24
26	14-16
28	14-16
30	14-16
1/16	56-60-64-72
5/64	56-60-64-72
3/32	38-48-50-56-60-64
.107	52
7/64	36-40-42-44-48-50-56
1/8	32-36-40-48
.132	50
9/64	30-32-38-40
5/32	24-26-28-30-32-36-38-40
11/64	24-26-30-32-36-38-40
3/16	12-18-20-22-24-26-28-30-32-36-40
.198	24
13/64	24-28-30-32
7/32	20-22-24-26-27-28-30-32-36-38-40
.227	24
15/64	20-24-28-32-40
1/4	16-18-22-23-24-25-26-27-30-32-36-40-50-56-60
17/64	18-20-27-28
.269	36
.277	40
9/32	18-20-24-27-28-32-36-40
19/64	18-24
.300	28
5/16	12-14-16-20-22-26-27-28-30-32-36-40-48-50-56
21/64	16-20-24
11/32	16-18-20-22-24-26-27-32-40
23/64	16-24
.365	28
3/8	12-14-18-20-22-26-27-28-30-32-36-40-48-56
25/64	16-24-27
.400	24
13/32	12-14-16-18-20-24-27-32-40
27/64	28
7/16	12-16-18-22-24-26-27-28-30-32-36-40
29/64	12
15/32	12-14-20-24-27-28-32-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
33/64	12-13-20
17/32	10-12-13-14-16-18-20-27-32-40
.550	24
9/16	13-14-16-20-24-27-28-30-32-40-48
37/64	12-27
19/32	12-18-20-24
5/8	9-10-12-13-14-16-20-24-27-28-32-36-40
41/64	11-18-24
21/32	10-11-18-20-27-32-40
11/16	20-.004
11/16	24-.010
11/16	11-12-14-16-18-20-24-27-28-30-32-36-40
23/32	11-16-20-27-32-36-40
47/64	10-16
3/4	9-11-12-14-15-18-20-22-24-26-27-28-32-36-40
49/64	10-16
25/32	10-16-20-27-32-40
.800	16
13/16	10-12-14-16-18-20-24-27-28-32-40
.822	8
27/32	10-18-20-27-32-40
7/8	8-10-11-12-13-16-18-20-24-26-27-28-32-36-40
.885	14
29/32	12-20-27-28
15/16	8-9-10-12-14-16-18-20-24-27-28-32-40
31/32	9-16-20-28-32
1	5-9-10-11-12-16-18-20-24-27-28-30-32-40-48
1-1/32	8-12-14
1-3/64	14
1-1/16	8-10-12-14-16-18-20-24-27-28-32
1-3/32	8-9-12
1-1/8	8-10-14-16-18-20-24-27-32
1-5/32	7-12-24-26-40
1-3/16	8-10-12-14-16-18-20-24-32
1.220	32
1-1/4	8-10-14-16-18-20-24-28-32
1-5/16	6-8-10-12-14-16-18-20-24-32-48
1-3/8	8-10-14-16-18-20-24-32
1-13/32	20
1-7/16	6-8-10-12-14-16-18-20-24-28-32
1-1/2	8-10-13-14-16-18-20-24-28-32
1-17/32	18
1-9/16	12-14-16-18-20-24-32
1-5/8	5½-8-10-12-13-14-16-18-20-24-28-32-40
1-11/16	10-12-14-16-18-20-24-32
1-3/4	5-8-10-12-13-14-16-18-20-24-28-32-40
1.7715	12
1.767	18
1-13/16	8-10-12-14-16-18-20-24-32
1-7/8	5-8-10-12-14-16-18-20-24-32
1-29/32	32
1-15/16	8-10-12-14-16-18-20-24-32
2	4½-6-8-10-12-14-16-18-20-24-32
2-1/16	12-14-16-32
2-1/8	4½-8-10-12-14-16-18-20
2-3/16	12-16-20
2-1/4	4½-8-10-12-14-16-18-20
2-5/16	12-16-18-20
2.360	18
2-3/8	4-8-10-12-14-16-18-20
2-7/16	16-20
2-1/2	4-6-8-10-12-14-16-18-20
2-9/16	12-18
2-5/8	8-10-12-14-16-20
2-11/16	16
2-3/4	4-8-10-12-14-16
2-7/8	8-10-12-16
2-15/16	16
3	3½-4-8-10-12-16-18
3-1/8	12-16
3-1/4	4-8-12-14-16-18
3-1/2	4-8-12-16
3-3/4	4-8-12-16
4	4-8-12
4-1/8	12

LEFT HAND TAPS

Size	Threads Per Inch
0	80
1	56-64-72
2	56-64
3	48-56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-32-40
12	24-28-32-40
14	20-24
5/32	36
3/16	32-40
1/4	20-23-24-25-27-28-32-40-48
.277	40
5/16	18-20-24-27-28-32-40
11/32	24
3/8	16-20-24-27-32-40
13/32	20
7/16	14-20-24-27-28-32-40
1/2	12-13-14-16-20-24-27-28-32-40
9/16	12-18-20-24-27-32-40
.622	8
5/8	10-11-12-16-18-20-24-28-32
11/16	11-16-18-20-24-32
.720	8
.722	8
3/4	9-10-12-16-18-20-24-32
13/16	10-16-18-20
7/8	9-10-12-14-16-18-20-24-32
15/16	32
1	8-12-14-16-18-20-24-28-32
1-1/8	7-12-18-24-32
1-1/4	6-7-8-12-16-18-20
1-5/16	18
1-3/8	5-6-8-10-12-16-18-20-24
1-7/16	10-12-18
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	5½-8-10-12-16-18-20
1-11/16	8-10-12-16-18-20-24
1-3/4	5-8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	5-8-10-12-14-16-18-20
2	4½-8-10-12
2.215	20
2-7/32	20
2-¼	4½-8-12
2-5/16	24
2-½	4-8-12
2-11/16	16
2-3/4	4
2-7/8	24
3	4-8

RIGHT HAND—UNLISTED "GUN" OR SPIRAL POINTED TAPS

Size	Threads per Inch	Size	Threads per Inch
0	80 NF		
1	56 NS	⅜	9 NC, 14 NF
2	56 NC, 64 NF	1	8 NC, 14 NF
9/16	12 NC, 18 NF	1⅛	7 NC, 12 NJ
⅝	11 NC, 18 NF	1¼	7 NC, 12 NF
11/16	11 NC, 16 NF	1⅜	6 NC, 12 NF
¾	10 NC, 16 NF	1½	6 NC, 12 NF

RIGHT HAND—UNLISTED "PULLEY" OR EXTRA LENGTH TAPS

Size	Threads per Inch	Size	Threads per Inch
4	40 NC, 48 NF	⅜	24 NF
5	40 NC, 44 NF	7/16	20 NF
6	32 NC, 40 NF	½	20 NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	9/16	18 NF
12	24 NC, 28 NF	⅝	18 NF
¼	28 NF	¾	16 NF
5/16	24 NF	Also Larger Sizes NC & NF	

RIGHT HAND "PIPE" TAPS

TAPER "NPT" Size	TAPER "NPT" Thread	STRAIGHT "NPS" Size	STRAIGHT "NPS" Thread	EX. LENGTHS TAPER "NPT" Size	EX. LENGTHS TAPER "NPT" Thread
1/16	27	1/16	27	1/16	27
¼	27	1¼	11½	⅛	27
2½	8	1½	11½	¼	18
3	8	2	11½	⅜	18
3½	8	2½	8	½	14
4	8	3	8	¾	14
		3½	8	1	11½
		4	8		

LEFT HAND 'PIPE TAPS' TAPER AND STRAIGHT

Size	Thread	Size	Thread
1/16	27	1	11½
⅛	27	1¼	11½
¼	18	1½	11½
⅜	18	2	11½
½	14	2½	8
¾	14	3	8

"OVERSIZE TAPS"

RIGHT HAND N. C. and N. F. SIZES

MACHINE SCREW No. 2 TO No. 5 PLUS .003, .005, .010

MACHINE SCREW No. 6 TO No. 14 PLUS .003, .005, .010, .015

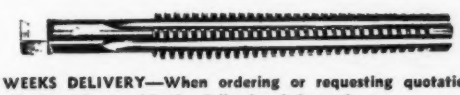
FRACTIONAL ¼" TO 1½" PLUS .003, .005, .010 AND .015

"UNDERSIZE ALSO AVAILABLE"

"PRICES OF SPECIALS ARE GOVERNED BY QUANTITY ORDERED" PRICES QUOTED UPON REQUEST

REGULAR LISTED SIZE TAPS AND TOOLS IN STOCK FOR IMMEDIATE DELIVERY

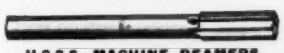
ACME TAPS AVAILABLE FOR QUICK DELIVERY



2 WEEKS DELIVERY—When ordering or requesting quotations, kindly furnish us with the following information:

(a) Kind of material being machined.
(b) Depth of hole, through or bottom.
(c) Tap to be used horizontally or vertically.
(d) Will tap turn, or is piece expected to be turned.
(e) Is tapping job expected to be done in one pass.
(f) Would tap be backed out of hole, or machine stopped for release of tap.
(g) If possible, submit thread length, and overall length of tap desired with a blue print.

SPECIAL REAMERS IMMEDIATE DELIVERY



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Prices On Application
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SPECIAL — RIGHT HAND HIGH SPEED "EXTRA LENGTH DRILLS" In Stock for Immediate Delivery

WE ARE WELL EQUIPPED TO SUPPLY YOUR NEEDS IN ANY QUANTITY, PARTICULARLY WHEN YOU ARE IN A HURRY

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CIRCLE INFORM-A-GRAM KEY NO. 135

MEN YOU SHOULD KNOW

Announcement of the appointment of **Donald C. Campbell** as works manager has been made by The Skinner Chuck Co. He will be in charge of manufacturing operations in the company's chuck and electric valve divisions.

◆

Vernon E. Riddell has become general superintendent of the new plant of The Cross Co., located in Fraser, Mich.

Two new company officers have been named by Snyder Tool & Engineering Co. **Leo P. Gajda** has been made vice president-engineering and **Bruce M. Regan**, vice president-manufacturing.

◆

Harland L. Printz has taken over as superintendent of tooling for the Aviation Gas Turbine Division of Westinghouse Electric Corp. He joined the company in 1936.

DIE DESIGNING AND ESTIMATING

Fourth Edition

368 pages, 26 chapters, over 400 illustrations, charts, and graphs. 165 Practical Points in Die Design and Construction. Comprehensively indexed.

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*Ohio customers add 3% sales tax.

COMPANY_____

BY_____ TITLE_____

ADDRESS_____

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Avrel Mason has become general manager of a newly formed division of Cargill Detroit Corp., which will handle engineering, manufacturing, and sales on all automatic gaging and size controls. He is succeeded as chief engineer by **Belding H. McCurdy.**

◆

James K. Wingard has moved into the position of manager of engineering of the Press Division of E. W. Bliss Co. He has been associated with the company for 20 years. In his new post, Mr. Wingard will be responsible for coordination for all press engineering activities in Bliss' various manufacturing divisions, headquartering in Canton.

◆

Arthur J. Durante is the new vice president-press manufacturing for R. Hoe & Co., Inc. He has been with the company for over 25 years.

◆

E. C. Wilson has been elected vice president of Illinois Gear & Machine Co.

◆

John F. Randall is serving as director of the manufacturing engineering office of Ford Motor Co. He steps into the post vacated by **Harold R. Foss,** who has been made director of the company's new assembly operations office. Mr. Randall's former position as assistant director of the manufacturing engineering office is being filled by **W. W. Aulepp.**

◆

Benjamin J. Davis has been elected vice president and general manager of Athol Machine & Foundry Co.

◆

John C. Wallace has been named vice president of engineering for Walworth Co. He formerly was with Hunt-Spiller Mfg. Corp.

◆

The new manager of manufacturing at the Specialty Transformer Department of General Electric Co. in Fort Wayne, Ind., is **J. Richard Garvin.** He succeeds **Richard J. Keyser,** who has been assigned to the Manufacturing Services Division in New York as consultant-shop operation.

◆

Andrew B. Pulliam has become vice president and general manager of the Marvel-Schebler Products Division of Borg-Warner Corp. He fills the position vacated by **G. V. Patrick,** who recently was named managing director of Coote-Jorgensen, Ltd., the company's new Australian affiliate.

◆

The promotion of **William J. Fath** to works manager has been disclosed by The Hydraulic Press Mfg. Co. He is succeeded as production control manager by **Warren E. Beck.**

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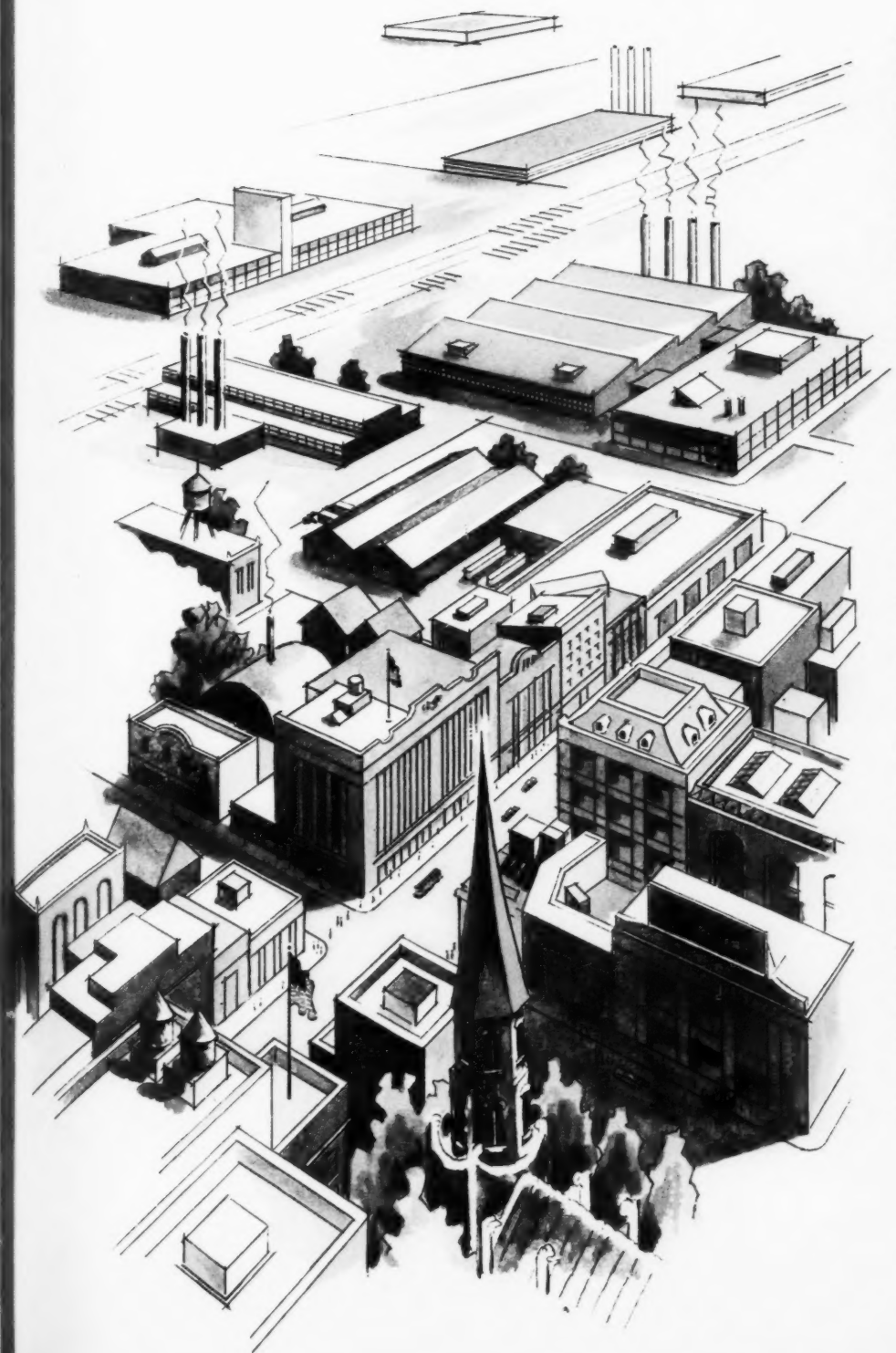

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salesmen, bookkeep
labor experts, etc.

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munal wealth.

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in church and scho
municipal governmen
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express our thanks f

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We, at Putnam Tool Company, are proud of our distributor organization . . . which has been in the making for 20 years. Strategically located from coast-to-coast, it consists of carefully chosen business men, respected members of their community who make their business a career of service.

Our distributors . . . and countless others like them . . . form an invaluable link in the chain of America's economic system. Because of them and their business establishments we, as a manufacturer of end mills, have throughout the country: warehouses, display rooms and local inventories from which our products can be sold and quickly delivered to industry.

Because of the nature of their business they must be men of diversity . . . have wide knowledge of many things. Putnam distributor personnel are familiar with many tools and their applications in manufacturing processes. Into the bargain they must be salesmen, bookkeepers, market analysts, tax and labor experts, etc.

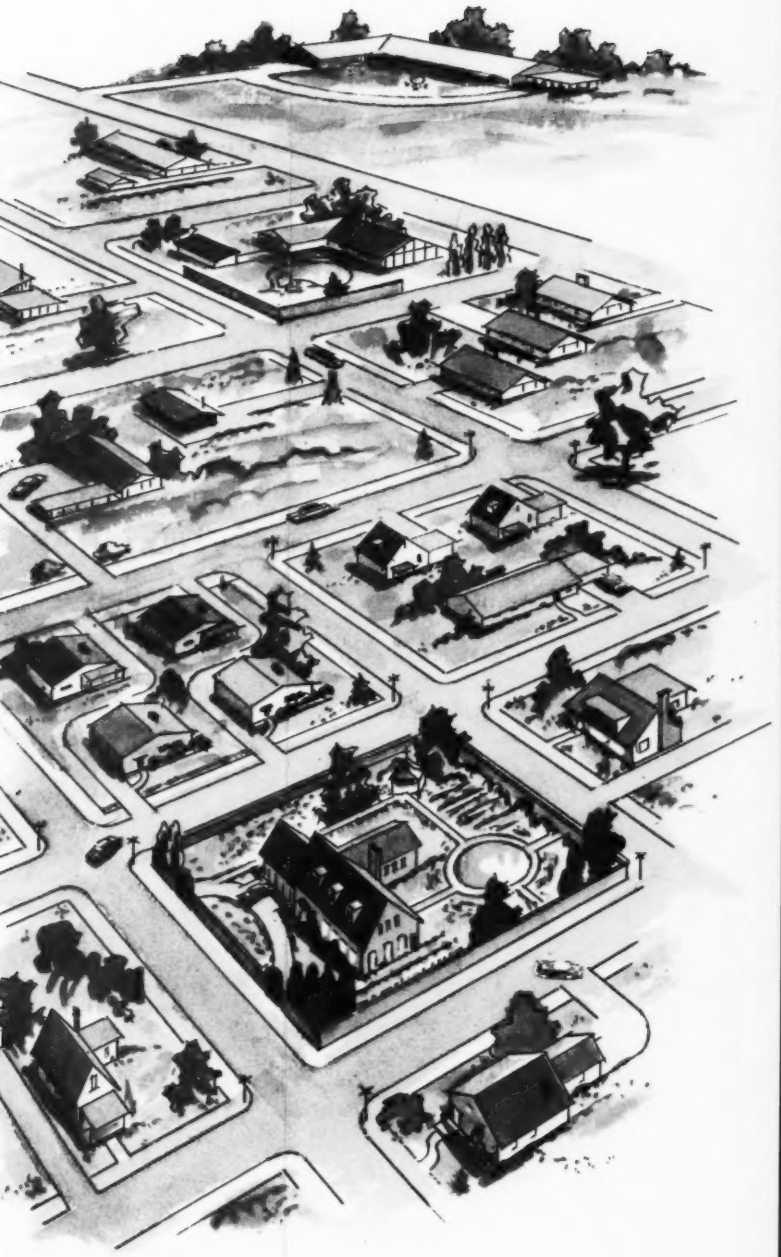
These men and their places of business are an integral part of their communities. They are employers of labor . . . sometimes large, sometimes small. In either case they are substantial business men whose taxes and services contribute materially to communal wealth.

With their roots deep in their respective communities these men take an active part in civic affairs. Putnam distributors are found on the rosters of service clubs, in church and school activities, and serving with municipal governments. They are in short: thoroughly American . . . solid business men . . . good neighbors.

This is why we, at Putnam Tool Company, consider it a privilege to be associated with these men and to express our thanks for the things they do.

PTC PUT
TOOL C
2981 CHARLEVOIX AVE

mmunity



T N A M
C O M P A N Y
AVENUE • DETROIT 7, MICHIGAN

OVER 1700 STANDARD TYPES AND SIZES OF PUTNAM HI-SPEED END MILLS

For your convenience and quickest delivery, Putnam catalog lists over 1700 standard types and sizes of highest quality . . . faster cutting . . . longer lasting Hi-Speed end mills. These standard end mills are carried in stock at the factory and by Putnam distributors throughout the country. This means . . . there is a Putnam standard for nearly every milling operation . . . you can select a standard end mill from the catalog today and it can be on your job tomorrow . . . simply call your local Putnam distributor.

COMPLETE LINE OF STANDARD END MILLS for ALUMINUM

Standard End Mills . . . For the first time you can select from a complete line of standard end mills designed specifically for milling aluminum . . . Putnam stocks 185 standard types and sizes.

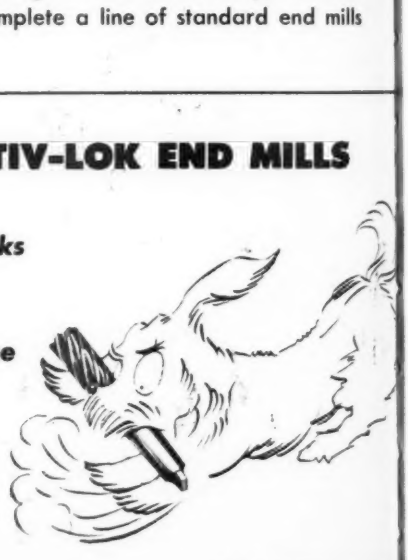
New Designs . . . These standard end mills have been developed through years of research and experience on aluminum applications. Over a year ago, Putnam introduced the first standard end mills designed for milling of aluminum. Today, no other manufacturer offers as complete a line of standard end mills for aluminum.

PUTNAM POSTIV-LOK END MILLS

★ *Eliminate Integral Shanks*

★ *Reduce Change-Over Time*

★ *Assure Positive Locking*



6132 LITHO IN U.S.A.—250 M 20-

PUTNAM

2981 CHARLEVOIX AVENUE • DETROIT 7, MICHIGAN

Appointment of **Fred C. Rufi** as regional engineering representative for the north-central states territory has been disclosed by Huck Mfg. Co. Mr. Rufi will provide engineering and service assistance to fabricators, assemblers, and erectors of metal products, structures, and aircraft in Wisconsin, Iowa, Minnesota, Montana, and North and South Dakota.

•

Three promotions in the machinery sales department of Pratt & Whitney Co., Inc. have been announced. Named to new positions were **Paul C. Renno, Wallace H. Tefft, Jr.,** and **J. James Tasillo.** Mr. Renno will correlate activities of the company's Connecticut machinery representatives. Mr. Tefft will be transferred to Chicago where he will take over the territory formerly served by Mr. Renno. Mr. Tassillo has become a sales representative and will take over the territory formerly covered by Mr. Tefft.

•

The estimates and proposals of the Hamilton-built presses of Clearing Machine Corp. are now in the charge of **Glenn C. Lechleitner,** new assistant sales manager, located at the main plant in Chicago. **Ted Goeller** has been promoted to assistant sales manager in charge of all dealer contacts. He will make his headquarters at the company's Hamilton, Ohio, plant.

•

William B. Summers is serving as coated abrasives field sales manager in the Cleveland-Pittsburgh districts of The Carborundum Co.

•

Joseph N. Kemple has become sales manager of the Page Steel and Wire Division of American Chain & Cable Co., Inc. He has taken over the sales duties of **W. H. Bleeker,** who has retired.

•

Themis C. Pailas has taken over as regional sales manager in the Cleveland district office of Heli-Coil Corp. He will cover Ohio, West Virginia, Michigan, and western Pennsylvania.

•

The new director of sales for Eastern Stainless Steel Corp. is **Richard C. Cunningham.** He succeeds **Edward A. Haggenmuller,** who has retired.

Crucible Steel Co. of America has announced the appointment of **John S. Billingsley** to the newly created position of assistant to the vice president-sales. He has been with the company in various sales capacities for 34 years.

•

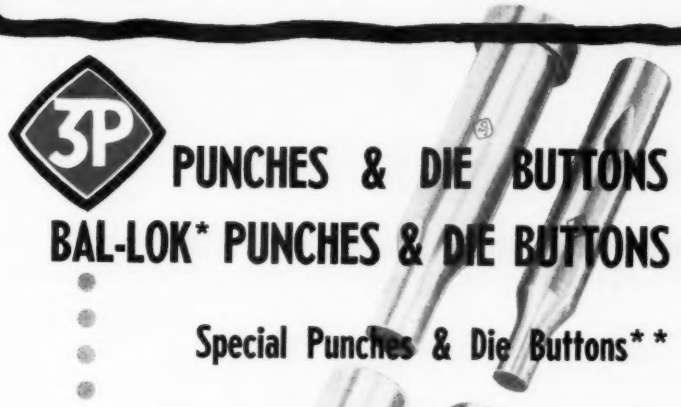
Appointment of **John I. Ross, Jr.** as sales and engineering representative in central Illinois for Michigan Tool Co. has been made known. He will handle the complete line of machine tools and cutters produced by the company, with headquarters in Peoria, Ill.

Henry R. Merrill has been appointed vice president in charge of sales for Behr-Manning Co., division of Norton Co. He joined the firm in 1930.

•

The new sales representative in the Flint, Mich., area for the Metallurgical Products Department of General Electric Co. is **R. J. Jablonski.** He will be responsible for coordinating field evaluations of Carboloy cemented carbide cutting tools. Mr. Jablonski succeeds **Paul Kunz,** who recently was transferred to Houston, Tex.

FOR THE TOOL ENGINEER WHO NEEDS EVERYTHING *Plus* FAST SERVICE!



3P PUNCHES & DIE BUTTONS

BAL-LOK* PUNCHES & DIE BUTTONS

Special Punches & Die Buttons**

No delay when ordering. Fast delivery service from more than 75,000 basic sizes in stock through Distributors in principal cities. 3P specializes in promptness, service.

3P Head Punches and Die Buttons, and Bal-Lok* Punches and Die Buttons are made of the finest quality tool steels. Both types are available in any DECIMAL size. No extra charge for high quality or ODD sizes. Bal-Lok* Punches are guaranteed interchangable in your present retainers.

"Still the best performer"

*Reg.
**Send Prints.
Prompt Quotations Assured

PORTER PRECISION PRODUCTS
PRinceton 1-6338 • P.O.Box 208 • Cincinnati 15, Ohio

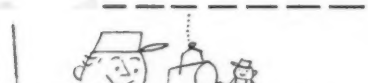
CIRCLE INFORM-A-GRAM KEY NO. 141

Q

Saving all you can on

Production Bronze Castings?

Here?



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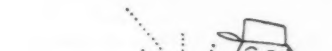


A

You do, with

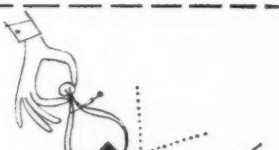
Ampco Shell Moldings!

Smoother cast surfaces!

Often, smooth enough to use as is.

Closer tolerances!

Most castings held to ±.015 — favorable shapes, ±.010.



Less machining!

In some cases, finishing operations are eliminated.

Lower cost!

High-speed, semi-automatic mold production means foundry economy.

AMPCO®

THE METAL WITHOUT AN EQUAL

AMPCO METAL, INC.
Milwaukee 46, Wisconsin
West Coast Plant:
Burbank, California
One-source service from raw material to finished product

FREE BULLETIN TELLS MORE. TEAR OUT COUPON AND MAIL TODAY!

AMPCO METAL, INC.
Dept. TP-6 Milwaukee 46, Wisconsin

Send me Bulletin G-36 on shell moldings; also information on other Ampco products I have checked.

Name.....

Title.....

Company.....

Address.....

City..... Zone..... State.....

- ☐ Specifications of Ampco Metal
- ☐ Ampco Wrought Products
- ☐ Ampco Stock Raw Materials
- ☐ Ampco in the Process Industry
- ☐ Ampco Centrifugal Pumps
- ☐ Ampco-Weld Resistance Welding Electrodes

D-61

GROWING PAINS

The Parker Appliance Company will spend a total of $2¼ million for capital improvements and expansion this year. This total includes the company's acquisition of Franklin C. Wolfe Company of Culver City, Calif., and Matheson Corporation of Los Angeles. In addition, the sum covers a new engineering and research building in Los Angeles; an addition to the Berea, Ky., plant of the Rubber Products Division; and new machinery and equipment.

◆

A 16,000-sq-ft addition to the Niles, Mich., plant of **National-Standard Company** will be completed by July 1. The company manufactures tire bead wire, high carbon flat steel, wire cloth, special machinery, and a variety of fine wires.

◆

United States Chemical Milling Corporation has announced plans to establish three new regional chemical milling facilities. The first regional plant will be started immediately in the Dallas-Fort Worth area. Others will be located on the East Coast and in the Midwest. Construction at its Manhattan Beach headquarters, which will add nearly 50% to manufacturing space, is now underway.

◆

A major rearrangement program, which will increase production capacity for the small turbine department of the Steam Division of **Westinghouse Electric Corporation,** has been disclosed. The program, which will almost double manufacturing area, will require two years for completion. The present building will be rearranged to provide space for piping, assembly, and testing of the smaller, standard-type turbines, and general machining. An adjacent building will be occupied to permit fabricating and welding, annealing, diaphragm manufacturing, and some equipment assembly operations, and will be equipped with a test area.

◆

Construction of a $4,000,000 materials handling equipment manufacturing plant and mid-continent parts depot in Forrest City, Ark., has been started by **The Yale & Towne Manufacturing Company.** It will have more than 157,000 sq ft of operating area.

Allen Manufacturing Company is building a new plant and main office in Bloomfield, Conn.

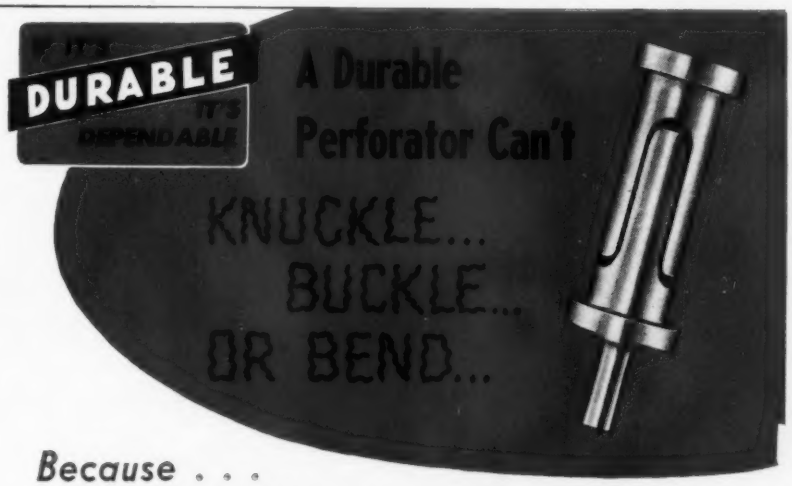
◆

The new plant of the Piston Ring Division of **Thompson Products, Inc.,** soon to be in operation in Manchester, Mo., will produce Spirolox retaining rings. The factory will also be equipped to manufacture smaller and larger diameter rings and in various metals and designs to meet individual, specialized applications, and several additional types of fastening devices.

In Hudson, Ohio, construction is underway on the 650,000-sq-ft manufacturing plant for the Euclid Division of **General Motors Corporation.** The plant is designed for producing crawler tractors for heavy construction and industrial use. It will be in operation by July 1958.

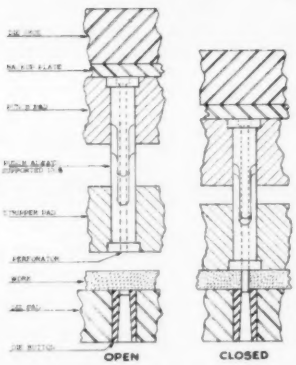
◆

Link-Belt Company will build a $5,000,000 facility in Indianapolis to replace and increase by 50% the capacity of its present Dodge bearing plant. The building will be completed in 1958.



Because . . .

WHEN PUNCHING IT IS 100% SUPPORTED BY A TELESCOPING SUPPORT-SLEEVE



Typical Installation

A Durable Perforator stays "alive" longer, because it is supported 100% the full stroke of its Telescoping Sleeve.

You get positive alignment, closer tolerances, burr free holes, regardless of the types of metal used. Holes are punched faster, easier and accurately.

Write For The New DURABLE ENGINEER'S HANDBOOK

121 pages showing 100 Practical Die Designs. NO CHARGE, NO OBLIGATION

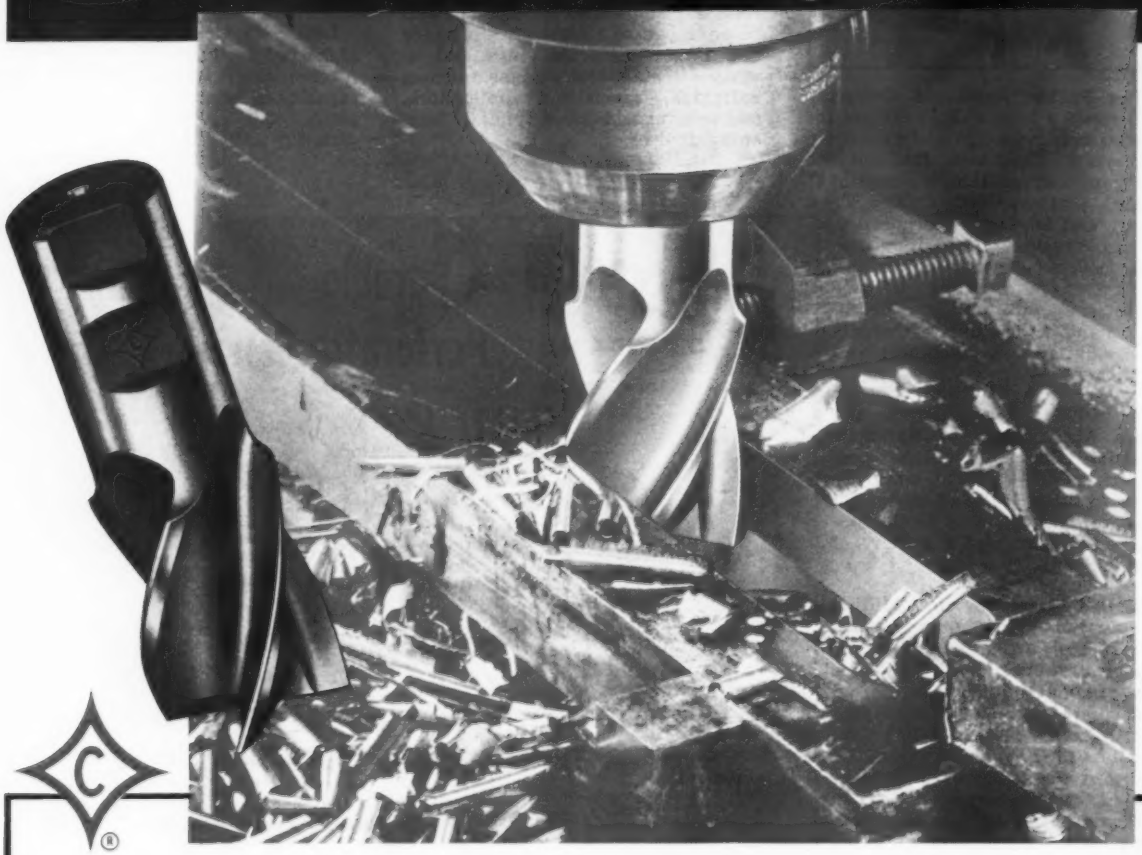
Patented and made exclusively by

DURABLE PUNCH & DIE COMPANY

9030 South Hermitage St., Chicago 20, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 143

86% More Slots per Grind



CLEVELAND 500 Series 4-Flute End Mills give Better Performance

On the job illustrated above, conventional 3-flute end mills were averaging 50 slots per grind in SAE 1020 steel. On the same set-up CLEVELAND 500 Series 4-Flute End Mills, with less cutting edge wear and longer size life, increased production to *93 slots per grind.* ◈ Yet this is only part of the story. The customer reported that these new CLEVELAND End Mills also gave a smoother finish, greater accuracy and better chip removal *without sacrificing speed or feed.* ◈ When you use CLEVELAND 500 Series End Mills you get *all* the advantages of 4-flute mills—and plunge cutting, too! Contact your nearest Stockroom, or . . .

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

Request your copy of this helpful, informative book that shows the complete line of CLEVELAND End Mills

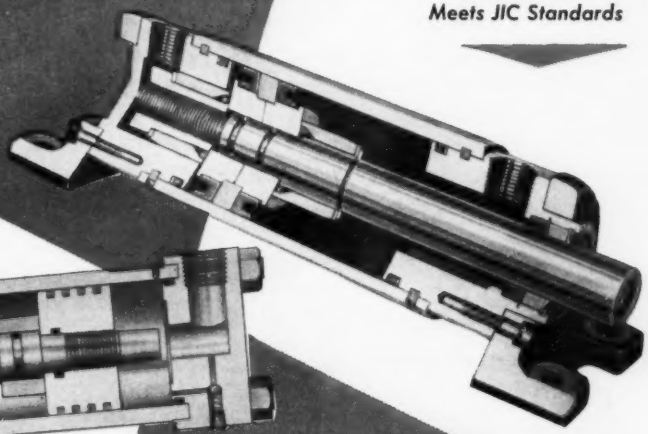
THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

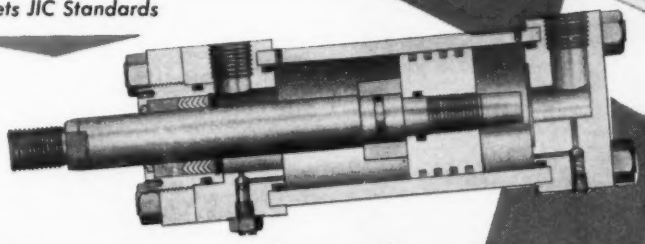
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58 • E. P. Barrus, Ltd., London W. 3, England

O-M CYLINDERS (AIR AND HYDRAULIC) have everything

O-M Tie-Rodless
150 PSI Air
Up to 1500 PSI Oil
With Internal
Locking Mechanism
Meets JIC Standards



O-M Series T-H
Hydraulic 2000 PSI
With Removable
Gland Cartridge
Meets JIC Standards



Construction and performance features that keep O-M cylinders right in the middle of AUTO-MATION

- Smooth, dependable operation at all practical speeds.
- Precision-honed, seamless steel body.
- Shock and vibration resistant.
- High-tensile alloy steel piston rod—ground, polished and hard-chrome plated.
- Multiple lip, self-compensating rod gland packing on all hydraulic cylinders.
- Self-compensating piston and rod packing on all cylinders, with packings available for fire-resistant fluids, also wide temperature ranges.
- Machined bearing bronze bushings for maximum service with minimum friction.
- O-ring static seals throughout – no flat gaskets to leak.
- Efficient wipers or scrapers on piston rods.
- Rolled steel precision machined end caps with ample sized ports.
- Adjusting needle for cushion control with ball checks for rapid full power starts.
- Versatile port orientation.
- Wide range of mounts and mounting accessories.
- Easily maintained – parts subject to wear can be repaired with minimum downtime.
- Plus many other features.

O-M Air and Hydraulic Cylinders are available in 1½" to 8" bores with standard and heavy-duty piston rods.

Mail coupon today for Bulletins 101A (O-M Tie-Rodless Cylinders) and 105 (O-M Series T-H Hydraulic Cylinders).

Engineering Service...

Consult an Ortman-Miller representative regarding your pneumatic and hydraulic problems. His broad experience with standard and special cylinder applications is available to you without cost or obligation. Use convenient coupon for name and address of O-M representative nearest you.

ORTMAN-MILLER MACHINE COMPANY

21 143rd Street, Hammond, Indiana

☐ Have representative call ☐ Send Bulletins 101A and 105

Name_____ Position_____

Company_____

Address_____

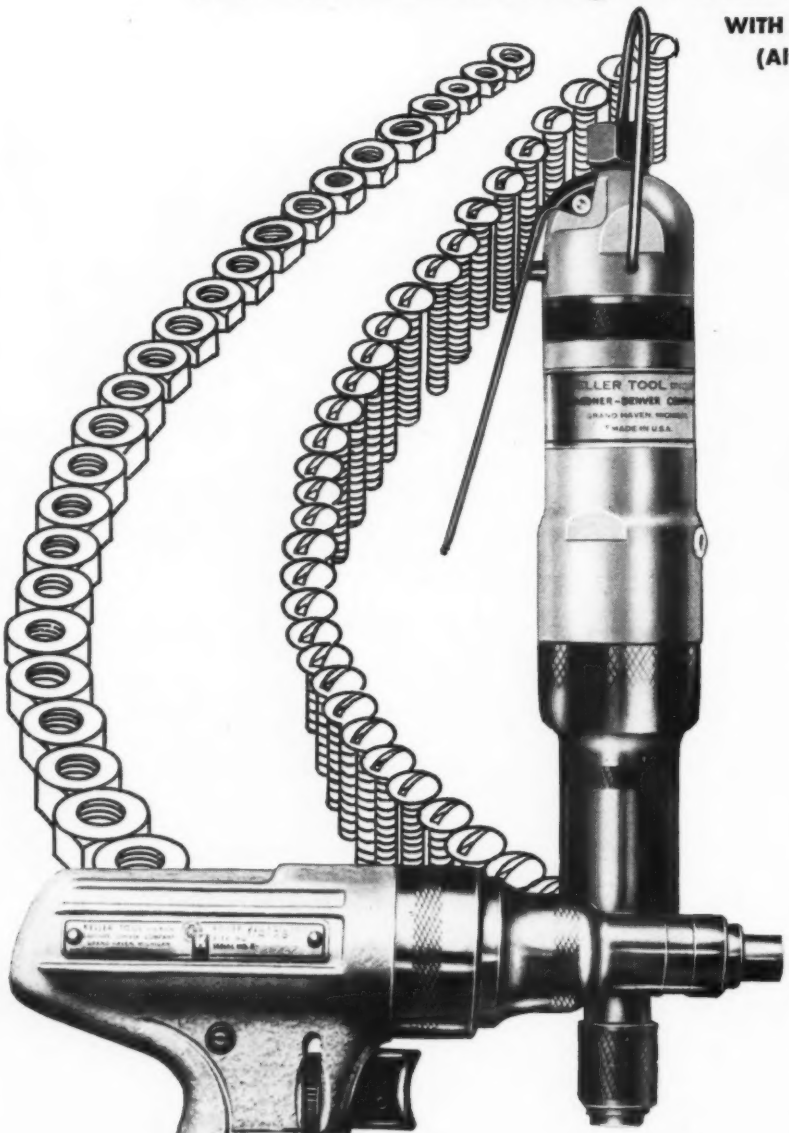
City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 145

A NEW AIR DRIVER WITH

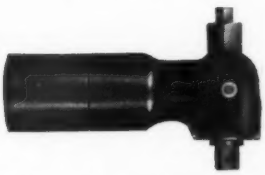
For Screw Driving or Nut Setting

WITH INTERCHANGEABLE ATTACHMENTS
(Always a feature of Keller Tools)



IN-LINE—HIGH PRODUCTION

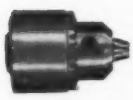
Drives: Straight, positive, cushion or "Safe-Torque".
Finders: Standard, collet, magnetic.
Holders: Snap-in, magnetic.



HEAVY DUTY—HIGH PRODUCTION
Single-end, double-end, long, short models.
In-line or detachable drives listed above.

LIGHT DUTY — CONFINED SPACES
90°, 45°, single end, double end.
Direct drive only.

***RATCHET WRENCH—IMPOSSIBLE JOBS** Variety of sockets, lengths, thicknesses.
Open end, 20° angle, unusual adaptations.



***DRILL—HIGH PRODUCTION**
Straight or angle type.

Requires different gear case.

NEW No. 2 MOTOR
With advanced design . . . styling

INCREASED SPEED—TORQUE RANGE
INCREASED POWER
LOW NOISE LEVEL
LOW MAINTENANCE

Bulletins 12-101 and 16-301

CIRCLE INFORM-A-GRAM KEY NO. 146

PRECISE TORQUE CONTROL

The new "SAFE TORQUE"* clutch assures accurate torque control for the new, more powerful in-line screw drivers and nut setters featured on the opposite page.

CONTROLLED TORQUE from 10 to 108 inch-pounds. Easily preset to predetermined torque. Retains accuracy on long production runs.

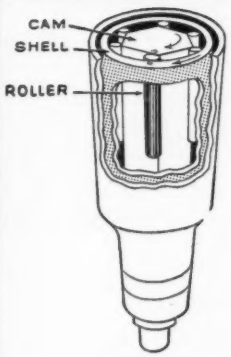
ACCURATE TORQUE setting on any fastening job—compressible, non-compressible, paper-thin or stacked materials.

SIGNALS OPERATOR with audible click when clutch automatically disengages at preset torque. No over-ride impacting. Tamper-proof.

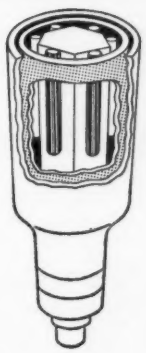
NEW MECHANISM INTERCHANGEABLE with cushion clutch mechanism in present 000, 00 and R size Keller tools.

*Licensed Trade-Mark of Scully-Jones and Company.

"SAFE-TORQUE" SPEEDS ACCURATE PRODUCTION

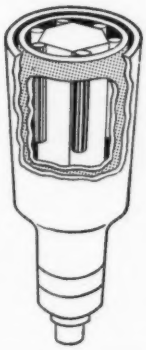


DRIVE—Equally spaced rollers are positioned between raised cam surfaces and the inside of a shell. Slight pressure on the bit causes rollers to climb into wedging position. The rotating clutch outer shell then transmits drive through rollers to cam and bit. Upon reaching a torque resistance which elastically deforms the driving shell, the rollers ride over high spots on the cam.

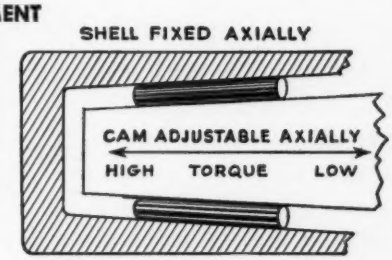


FREE WHEELING—The clutch is now in free wheeling and will so remain when the tool is lifted. No power is transmitted to the bit.

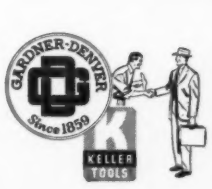
READY TO DRIVE—Instantly, upon applying bit pressure to the next fastening, the clutch again engages to repeat driving action. No lost driving motion . . . no sliding surfaces to create frictional wear.



TORQUE ADJUSTMENT—No tools needed for torque adjustment. Calibrations on the adjusting collar permit preset torque from 10 to 108 inch-pounds. Tamper-proof by operator. Bulletin 12-81.



CALL YOUR KELLER TOOL SPECIALIST TODAY FOR A DEMONSTRATION

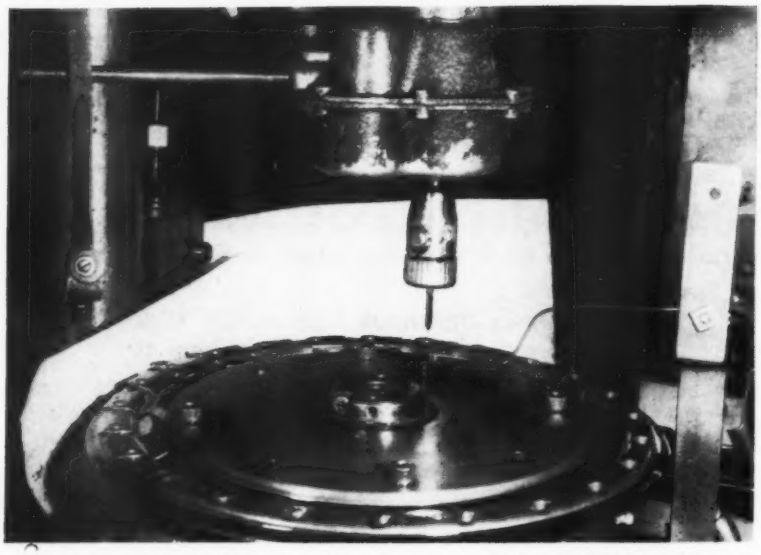


ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 147



THIS AUTOMATIC MACHINE taps 2900 parts per hour with Besly 8-32 NC Spiral Pointed Machine Screw Taps. An air indexed circular feed table moves parts into position, down comes the tap, up goes the tap and on to the next piece — all automatic except placement and removal of parts.

SMALL PARTS finishing is the busines of Keades, Inc. Included are "T"-nuts, bolts, rivets, clips, pins — primarily for the automotive industry. Note Besly 8-32 NC Spiral Pointed Tap right.

BESLY 8-32 NC SPIRAL POINTED TAP . . .

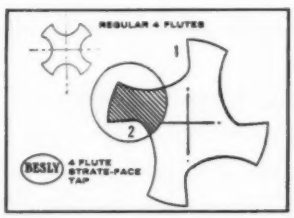
"The Touchstone of Success"

says LEN KEAST of KEADES, Inc.

To increase sub-contract work, Keades, Inc., Wyandotte, Mich., needed a tap to thread small parts in an automatic production machine. Since most taps available failed on the job they called on Besly's Engineering Service for a solution to the problem.

Besly Engineers designed the Besly 8-32 NC Spiral Pointed Machine Screw Tap as the answer. The spiral point on this tap causes it to cut with a shearing action which deflects chips out and ahead of itself. Chips do not accumulate thus eliminating tap lag and breakage. Shallow flutes permit a thicker and stronger tap which gives longer service life. These features, assured Besly Engineers, provide a tap which can operate at higher speeds and less driving power—especially good news to Keades.

Keades now operated two automatic machines, of their own design—shown above, equipped with Besly 8-32 NC Spiral Pointed Taps which thread 2900 pieces per hour at very close tolerances. Each tap lasts 16 hours. This compares to 1500 pieces per hour with taps lasting only 4 hours, by former methods. Savings now amount to $70 per 200,000 parts.



NEW "STRATE FACE" TAP FOR CAST IRON

Designed for freer cutting, more accuracy, longer tap life and less tap breakage. Features — (1) straight cutting face ("Strate Face") has accurately controlled rake angle, (2) new flute and core design with high strength zone makes stronger tap, (3) "Stemite" coating prevents abrasion, stops welding, adds lubricity. Available from No. 6 to ¾" for cast iron tapping only.

ASK YOUR DISTRIBUTOR FOR NEW TAP CATALOG 801, *or write* . . .

Engineering, Service and Specials . . . are a Besly Specialty

BESLY

BESLY-WELLES CORPORATION
Est. as C. H. Besly & Co. 1875
128 Dearborn Avenue • South Beloit, Illinois

TAPS • DRILLS • REAMERS • END MILLS • TOOL BITS • GAGES • CARBIDE TIPPED TOOLS • BLANKS • TOSS-AWAY INSERTS and HOLDERS

CIRCLE INFORM-A-GRAM KEY NO. 148

another VALVAIR *first...*

NEW SPEED KING PLUG-IN CONTROL VALVES

Compare ... and you'll buy

Valvair

RESEARCH...
PROGRESS...
LEADERSHIP...

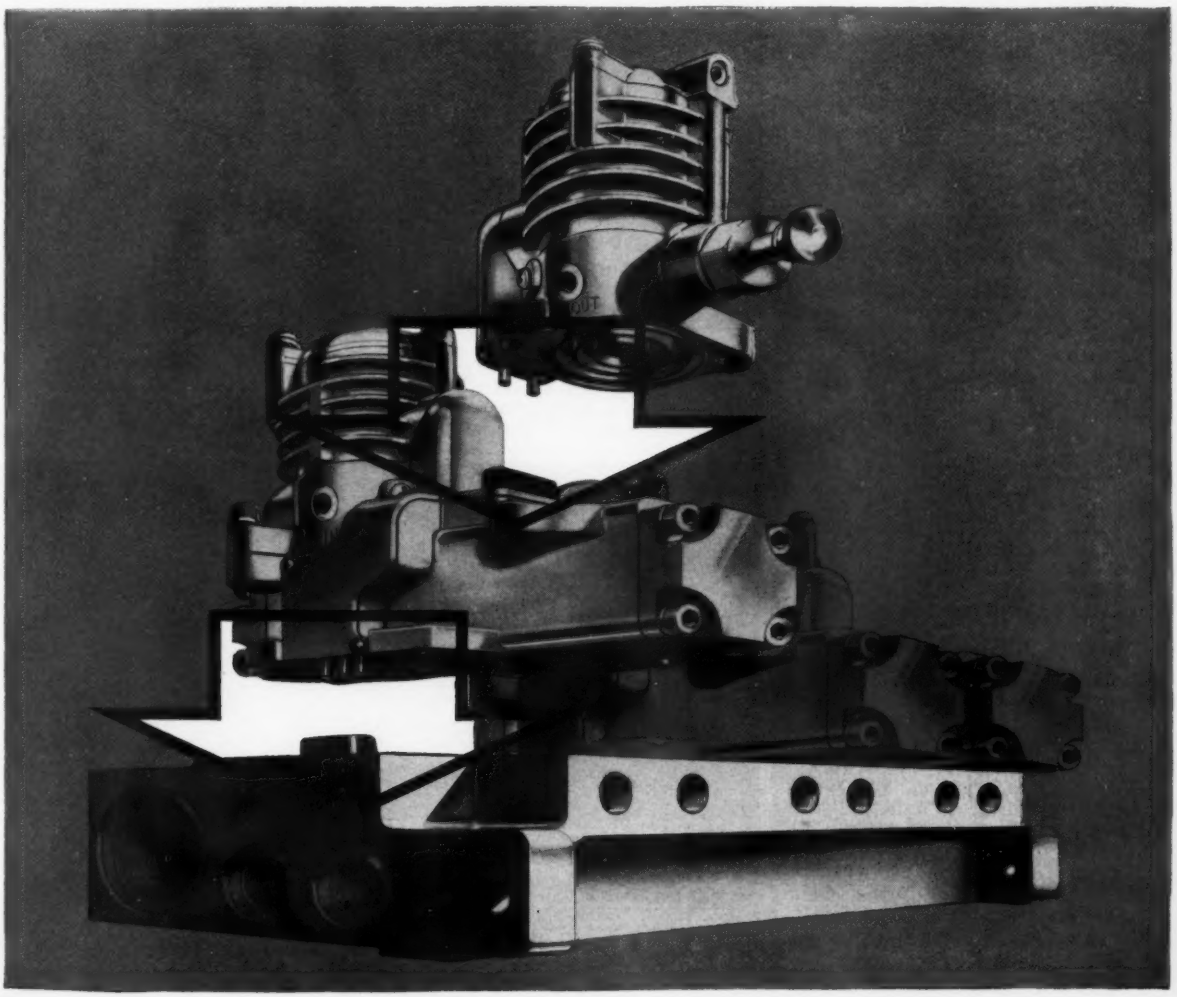
Representatives in principal cities

Valvair's new Speed King ¼ in., 4-way control valves have built-in plugs and connectors—complete electrical connections automatically! All connections are made in manifold or sub-base—valves simply bolt in place. Pilots plug in, too, for fastest in-service maintenance!

And, compact size, peak performance plus multi-million cycle dependability, assured by aluminum and stainless steel components . . . coil guaranteed against burn-out for life of valve . . . manifold, sub-base or foot mounting—single or double solenoid . . . JIC pilots . . . 35—200 psi range . . . ¼ in. NPT ports . . . coils for ac or dc, any voltage . . . optional manual over-ride . . . all are yours with ¼ in. Speed Kings!

Put these advanced-design valves to work on your machines . . . their performance and economy will amaze you! Valvair Corporation, 454 Morgan Ave., Akron, Ohio. AA-5693

Multiple manifold mounting; 3 station shown, 2 station available. Conduit port, 1¼ in. NPT; common inlet and exhaust ports, ½ in. NPT; cylinder ports, ¼ in. NPT. Manifolds may be ganged for installation of any number of valves. Sub-base and foot-mounted valves also offered.



CIRCLE INFORM-A-GRAM KEY NO. 149

Keep Informed • CATALOGS BULLETINS • SPECIFICATIONS

PUBLICATION

For Ease and Convenience Use TOOLING and PRODUCTION Inform-A-Gram Cards

Establish and Maintain High Standards of Accuracy and reduce gaging time and costs with Electrolimit comparators. Two types are produced — internal and external. A bulletin covers the Electrolimit gaging principle, operation, and applications. In addition, it illustrates and

describes the models available. For your copy of Circular 601, write to Pratt & Whitney Co., Inc., Charter Oak Blvd., W. Hartford 1, Conn., or
Circle Inform-A-Gram No. B1.

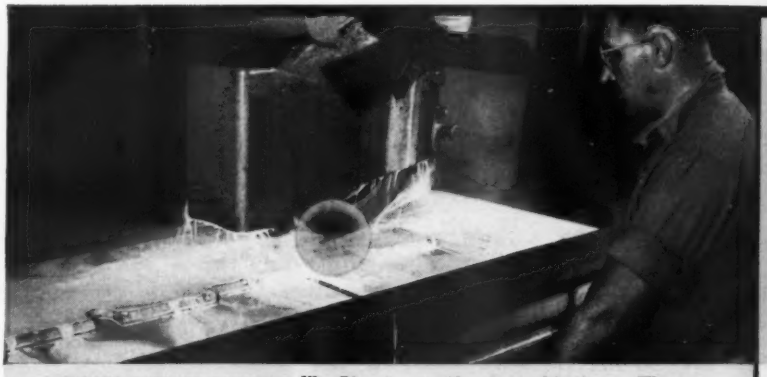
Application of Method X Process of electrospark machining to the Style 243-6 vertical electrospark machine is covered in a new bulletin. A detailed explanation of the Method X process is given as well as a working description, floor plan, and specifications of the new machine. The unit is intended for machining hard and tough metals or cutting special shapes that would be difficult to produce by conventional machining. Copies of Bulletin 43373 can be obtained from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, or —
Circle Inform-A-Gram No. B2.

Cooler Grinding, Faster Cutting, Longer Life and Better Finish are possible using new SA Borolon grinding wheels. These grinding wheels are used for precision work such as surface grinding, and tool and cutter grinding. A bulletin lists the advantages and specifications. It also shows the standard stock sizes and shapes of the grinding wheels that are available. For further details, get Bulletin ESA-272 from Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, or —
Circle Inform-A-Gram No. B3.

A Quick-Connect Coupling Using Teflon Seals is described in Bulletin 270 made available by Snap-Tite, Inc., Union City, Pa. The HK coupling will handle acids, alkalies, solvents, and high pressure steam, functioning perfectly between −100°F and +500°F. The bulletin contains a detailed cutaway of the coupling, in addition to listing dimensions and ordering information.
Circle Inform-A-Gram No. B4.

Reduce Operating Costs and Speed Work with the Jotru torque wrench. It is designed for production line and construction use. Maximum variation of torque setting is only ±2% under actual operating conditions. For further information and specifications, request a copy of the circular on the torque wrench from Jo-Line Tools, Inc., 8442 Otis St., South Gate, Calif., or —
Circle Inform-A-Gram No. B5.

With your surface grinders



ON BIG SURFACE GRINDERS, like Blanchards, Hanchetts, Mattisons, Thompsons and Hills, G BOND-32 ALUNDUM wheels bring you many "Touch of Gold" advantages. Such as cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . less dressing and more pieces per dressing . . . more work, and more kinds of work, per wheel.

ON SMALL SURFACE GRINDERS, including toolroom machines, G BOND-32 ALUNDUM wheels give you the same value-adding, cost-cutting benefits. They're ideal on grinding machines like Brown and Sharpes, Crystal Lakes, Deltas, Doalls, Gallmeyer and Livingstons, LaSalles, Reids, Sanfords, Taft-Peirces, Nortons and many others.

CIRCLE INFORM-A-GRAM KEY NO. 150

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

"The Induction Heating Review" is a publication printed periodically by Lepel High Frequency Laboratories, Inc., Woodside, N. Y. It contains articles of value in simplifying manufacturing operations where heat is required. For instance, the February issue discusses joining electronic tube components without flux, transistor and diode manufacturing, and high temperature fatigue tests.
Circle Inform-A-Gram No. B6.

Measure Heights Up To 61" with accuracies of ±0.000005"/in of height with the Micro-Accurate optical height gage. It is covered in a six-page folder illustrated with photos and line sketches. Also presented in the folder is a detailed description of the use of the gage. Copies of the folder are made available by Webber Gage Co., 12912 Triskett Rd., Cleveland 11, or —
Circle Inform-A-Gram No. B7.

Produce Coarse Pitch Threads to a Class 4 Fit with the Lanroll thread rolling attachment. Its design features include rolling threads directly to shoulder with safety, wide range coverage, precise and reliable timing

of rolls, positive size adjustment, and a simple means for correcting taper. Five sizes are available for the various sizes of automatic screw machines. Details are found in Bulletin G-96-2 from Landis Machine Co., Waynesboro, Pa., or —
Circle Inform-A-Gram No. B8.

Precision Indexing of O.E.M. Machines and Instruments with low torque requirements and a need for indexing rates up to 2,000 rpm is performed by E Series small roller gear drives. A bulletin gives load ratings and dimensions for 19 standard units with from 3 to 12 stops and indexing periods of 120°, 180° and 270°. Bulletin 107A, supplementing Catalog 107 and offering a range of smaller and faster mechanisms than those formerly available, is supplied by Ferguson Machine Corp. of Indiana, Roller Gear Div'n, P. O. Box 5841, St. Louis 21, Mo., or —
Circle Inform-A-Gram No. B9.

Assemble a 65" Horizontal Indexing Machine from standard machine components. A circular contains illustrations and descriptions of "off-the-shelf" machine components that are available. They are engineered for quick assembly into complete low-cost, high production, flexible automatic machines. For further details, see the circular published by The Hartford Special Machinery Co., Homestead Ave., Hartford, Conn., or
Circle Inform-A-Gram No. B10.

...TAKE DEEP COST CUTS

Norton G BOND-32 ALUNDUM wheels add the profit-boosting "TOUCH of GOLD" to any size machine*

The Norton G Bond is the most efficient ever developed for precision and semi-precision grinding. It holds each abrasive grain just long enough for maximum cutting action, assuring a constant grinding surface of fresh, sharp cutting edges.

Norton 32 ALUNDUM abrasive is another big advancement in grinding progress — ideal for surface grinding requiring fast stock removal and heavy feeds.

Remember: only Norton offers you such long experience in both grinding wheels and grinding machines to help you produce more at lower cost. See your Norton Distributor for further facts on how the G Bond and 32 ALUNDUM abrasive combine to form the best "Touch of Gold" team for grinding high speed and alloy steels. (For other applications investigate other Norton ALUNDUM and CRYSTOLON* abrasives.) Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.

W-1790

NORTON
ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS:
Abrasives • Grinding Wheels • Grinding Machines
Refractories

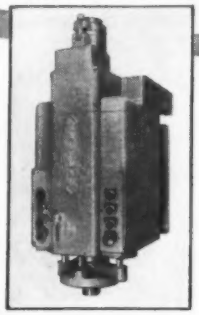
BEHR-MANNING DIVISION:
Coated Abrasives • Sharpening Stones
Behr-cat Tapes

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

CIRCLE INFORM-A-GRAM KEY NO. 151

the all new
VERTICAL or
HORIZONTAL
101 tapper

A brand new . . . Kaufman Tapper with more new operating, control, and production features . than has ever before been incorporated into a single tapping head. You can mount it vertically or horizontally . . . arrange it in combinations to do two or more operations . . . or mount it horizontal or angular in combination with vertical heads to do various operations simultaneously. Additional revolutionary features include:



- An extremely sensitive torque control . . . which signals overload, stops the machine automatically to avoid tap breakage.
- A pressure lubricated lead screw.
- Positive precision depth control.
- Air operated clutch with instant reversal.
- A simple non-reversing motor drive.
- Spindle speeds ranging from 35 to 785 RPM.

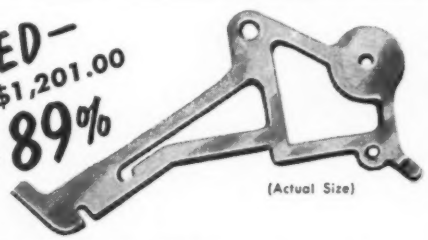
KAUFMAN

These and many additional features are incorporated into the new 101 Series Kaufman Tapper. For more complete information about this and other Kaufman Tappers, write

KAUFMAN MFG. CO.
529 S. 29th Street Manitowoc, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 1521

SAVED— $1,201.00 or 89%



(Actual Size)

After consultation with our engineering staff and with the use of dies from our tremendous library maintained specifically to save our customers time and money, this part illustrated actually saved one manufacturer 89% of usual production costs!

Price breakdown was as follows:

Tools	$152.00
Labor	.069
Material	.0053

LOW die cost
FAST delivery
- Blanking
- Forming
- Piercing
- Drawing
- Extruding
- Stenciling
- Tapping
- Countersinking
- Plating
- Machining
- Painting
- Grinding
- Welding

Yes, WLS SPEEDTOOLING for small quantity stamping needs is a saver every time! A radical production advancement, it eliminates most of the cost required for permanent dies. Finished parts are produced to tolerances as close as those from tools costing ten times as much. When jobs are completed WLS SPEEDTOOLING is stored for future use.

Use WLS for production quantities up to 100,000 when low cost, fast delivery, possible design changes for virtually nothing, are important factors!

FREE
1. Write now for a free sample part with a cost summary.
2. Our free bulletin also illustrates 40 small stampings.
3. Send in your blueprints to our engineering department for a prompt quotation.

WLS STAMPING COMPANY
3283 E. 80th Street • Cleveland 4, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1522

HIGHER SPEEDS/
FASTER GRINDING/

kipp

AIR GRINDERS

Model JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.

kipp

MADISON-KIPP CORP.
212 Waubesa St. • Madison 10, Wis., U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1523

A Fixture Clamps and Details Catalog has been announced by West Point Mfg. Co., 26935 W. 7 Mile Rd., Detroit 19. The 16-page catalog includes dimensional drawings, tables,

and prices of all fixture clamps and details available. Requests for copies of the catalog will be filled by the company, or —
Circle Inform-A-Gram No. B11.

33 Advantages of Model 1433 Tandem Gear Hobber are listed in Bulletin TH-33 from Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12. The hobber meets the need for a completely automatic hobbing line for high volume production of a single gear. The bulletin details the design, construction, and operation of the machine. Also discussed is the self-contained automatic gear production equipment — checker, size control, loading and unloading, and chip disposal. In addition, full specifications are presented.
Circle Inform-A-Gram No. B12.

Revised Size, Capacity, and Weight Tables are contained in four-page Bulletin 1044 from Rockwell Mfg. Co., Meter and Valve Div'n, 400 N. Lexington Ave., Pittsburgh 8. The revision was necessitated by the doubling of the maximum inlet pressure of the 120 Line of sensitive regulators. The bulletin points out that differentials up to 10 psi can be used provided the control tube is taken downstream.
Circle Inform-A-Gram No. B13.

Increased Lathe Production is assured using the PreCor collet closer. It permits feeding and releasing of bar stock through the collet without stopping the lathe. The collet closer is easily attached to any lathe with a $1\frac{1}{16}$" collet capacity using a No. 5C collet. Further details are in a circular from Precision Processing Co., 3155 Verdugo Rd., Los Angeles 65, or — **Circle Inform-A-Gram No. B14.**

The Advantages of Subland Two Diameter Drilling as compared to step drill two diameter drilling are discussed in a booklet released by Mohawk Tools, Inc., 910 E. Main St., Montpelier, O. The steps in manufacturing both drills are noted and the maintenance requirements presented. Also included is a contrast of production records. Copies of the booklet, "Which One Should You Use . . . Subland or Step?", are provided by the company, or —
Circle Inform-A-Gram No. B15.

Low Cost, Efficient Storage of Pallets, Skids, and Dies is possible with Sturdi-Bilt adjustable storage racks. Using a Float Wedge Construction, they can be assembled without tools, nuts, bolts, welding or cross bracing. The racks can be interchanged and the bulk bins readjusted to meet changing storage needs. For complete details, see Bulletin BB-956 prepared by Sturdi-Bilt Engineering Co., 2501 W. Peterson Ave., Chicago 45, or —
Circle Inform-A-Gram No. B16.

2548

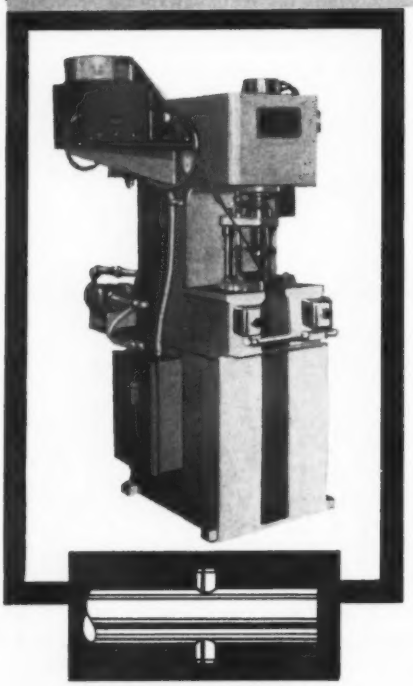
DIEMAKERS! this
DIE-PART PORTELVATOR®
(OR AN ENGINEERED VARIANT)
will speed your work and ease your "handling."
Top plate raises and lowers for fitting operations and rotates 360° to give easy access to die.

Write for our FREE Bulletin No. 2548. It gives full details.

THE HAMILTON TOOL COMPANY • 832 SOUTH NINTH ST.
HAMILTON • OHIO • U. S. A.

CIRCLE INFORM-A-GRAM KEY NO. 153

Acme Hydraulic Bench Press Performs Assembly Operation



Split Pin Assembled in Shaft

A standard Acme BA4-A Hydraulic Press is equipped with a vibratory feeder which automatically feeds a small split pin into a pusher unit attached to the end of the press ram. This unit then travels downward until it contacts a second part which is a small shaft like part manually placed into a receiver fixture on the press table by the operator. The shaft is rotated in the fixture until an aligning detent locates the hole into which the split pin is to be pushed . . . When the ram pusher contacts the shaft in the fixture, it stops and a plunger continues pushing the split pin into the longer shaft until it comes to a fixed and predetermined stop which assures that the split pin is properly located in the longer shaft. This assembly forms part of an automatic transmission. Assembly rate is approximately 480 per hour. This press complete with tooling was recently supplied a customer in the automotive field.

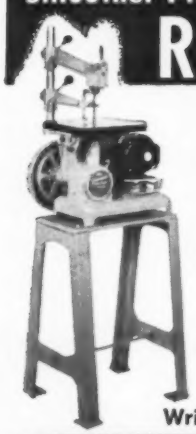
Contact us on your Broaching, Broach Tooling and Press Problems.

ACME BROACH CORP.
MILAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1541

Smoother Production! Higher Output! Lower Costs!

RICE-MILWAUKEE



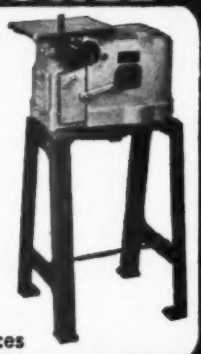
DIE FILERS . . . for straight-line sharp corner filing, sawing and lapping.

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

PROFILE GRINDERS

. . . for high speed Precision Grinding of Curved and Irregular Contours.

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.



Write for Illustrated Bulletins and Prices

RICE PUMP & MACHINE COMPANY
228 PARK AVENUE BELGIUM WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1542

CONTRACT TOOLING AND PRODUCTION

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings,

Michigan

DAVIS TOOL and ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery. Sheet Metal Stampings and Assemblies.

UNIVERSAL GEAR & MACHINE CO.
1301 E. McNichols Road
Detroit, Michigan, Forest 6-2280
Gears, Sprockets, Worms, up to 168". Free Catalog of 8,000 Stock Items. Free 36-page Catalog on our manufactured machinery of complete slitting, uncoiling, recoiling and cut to length lines.

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave., Cleveland, Ohio. MU 1-2600
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, Ohio
WO 1-4736
Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, Ohio. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio, WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

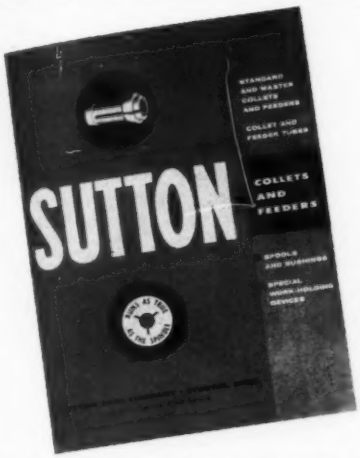
NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 1-8644. External Cylindrical Lapping Machines. Special Machinery, Tools, Dies, Jigs, Fixtures.

Pennsylvania

MEDAL MANUFACTURING CO.
328 Vine St., Sharon, Pa. Machined parts, complete machine assemblies, special machinery. Send us your prints for quotes.

A 24-Page Collet Catalog has been published by Sutton Tool Co., Sturgis, Mich. Featured are standard collets and feeders, Quick Change master collet and Style L master feeders, Full Floating master collets,



Burns Style taper lock master feeders, and the Super Feeder. For each model are given price lists, ordering instructions, cross-section views, and illustrations. Copies of Catalog 22 are made available by the company, or — **Circle Inform-A-Gram No. B17.**

Deburring, Chamfering, and Countersinking Operations are handled by tool products from Nobur Mfg. Co., 6860 Farmdale Ave., N. Hollywood, Calif. A bulletin covers the Noboursink, Noburod, Noburmatics H and G, and Ellipti-Bur tool, giving descriptions, operation, and applications. For complete details, get a copy of Bulletin 357 from the company, or —
Circle Inform-A-Gram No. B18.

The Complete Line of Rockwell-Delta Drill Presses is described in a 12-page illustrated bulletin. Specifications are given for floor and bench, single and multiple spindle models in several basic sizes. The catalog tells how the presses have been used to supplement or replace heavier, more expensive machines in production operations in several plants. For a copy of the bulletin, "12 Pages of Facts," write to Rockwell Mfg. Co., Delta Power Tool Div'n, 470 N. Lexington Ave., Pittsburgh 8, or —
Circle Inform-A-Gram No. B19.

An Actual Case History is detailed in V-B Brief, Vol. 55, No. 4 made available by Vapor Blast Mfg. Co., 3131 W. Atkinson Ave., Milwaukee 16. Covered is the vapor blast liquid honing of a diesel engine. Get your copy of the literature from the company, or —
Circle Inform-A-Gram No. B20.

Page Submerged Arc and Inert Gas Welding Wire is highlighted in Bulletin DH-402A now available from American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport 2, Conn. Described are the many Page methods of packaging welding wire, including the Payoff-paks. In addition, the bulletin gives complete analyses of stainless steel, low alloy, and carbon steel welding wires produced by the Page Steel and Wire Div'n.
Circle Inform-A-Gram No. B21.

A Complete Line of Optical Tooling Equipment is listed in a new illustrated catalog. Included are standard items as jig transits, alignment accessories, and Paragon tilting levels. Also covered are a large number of accessories, instrument stands, fixtures, collimators, scales, targets, and optical attachments, including the optical square. Copies of the catalog can be obtained by writing to Keuffel & Esser Co., Hoboken, N. J., or —
Circle Inform-A-Gram No. B22.

VARIMATIC®

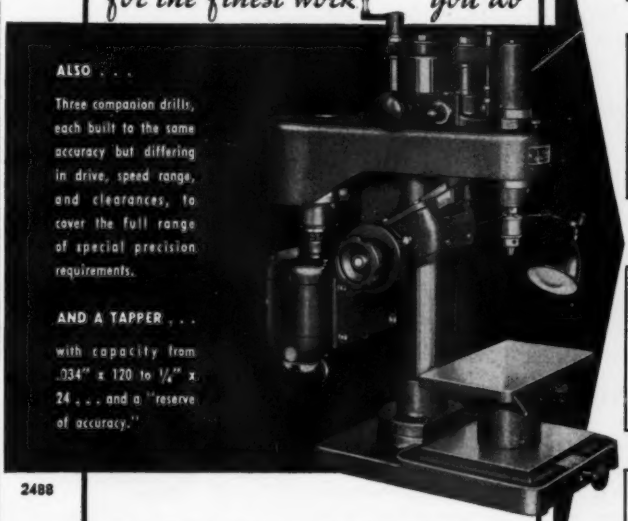
The SUPER SENSITIVE, SMALL-HOLE, PRECISION DRILLING MACHINE

With capacity of .004" to 5/16" in *all* drillable materials, and spindle speeds from 840 to 9300 R.P.M. infinitely variable in two speed ranges . . . *this* is the machine which the precision industries rely upon to handle the "heart-break jobs."

"for the finest work you do"

ALSO . . .
Three companion drills, each built to the same accuracy but differing in drive, speed range, and clearances, to cover the full range of special precision requirements.

AND A TAPPER . . .
with capacity from .034" x 120 to 1/4" x 24 . . . and a "reserve of accuracy."



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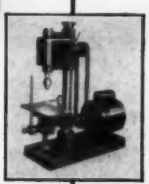


You will want full information about the Hamilton Line of precision drilling and tapping machines. And we will be glad to furnish it.

Ask for our
FREE
BULLETIN NO. 2488

ADDRESS

IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

THE HAMILTON TOOL COMPANY
832 South Ninth Street
HAMILTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 155

All Types of Abrasive Shot and Grit are included in an illustrated catalog containing SAE specifications. Listed are the characteristics and uses for the entire 20th Century Line manufactured by Cleveland Metal Abrasive Co. Also presented are the methods and advantages of shot peening and impact cleaning, and the proper abrasive mixtures. Get your copy of Catalog CMA-357 from The Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland 8, or — **Circle Inform-A-Gram No. B23.**

"Specialized Metal Tubular Parts" describes the facilities and services for the design, tooling, and fabrication of precision tubular parts and sub-assemblies. Illustrated are typical precision parts. The bulletin covers components made from tubing in the range of 0.010" to ⅝" dia with tolerances as low as 0.001". Copies of Bulletin 2056 are made available by H & H Machine Co., Inc., Noble and Jackson Sts., Norristown, Pa., or — **Circle Inform-A-Gram No. B24.**

RANGE OF HORSEPOWER, STROKE, SPINDLE SPEED AND THRUST IN EX-CELL-O QUILL TYPE POWER UNITS

Ex-Cell-O Hydraulic Power Units come in sizes suitable for a wide range of applications. Compact design makes it possible to place them at close center distances either in line or radially around a fixture. No matter what the application, you get smooth, dependable operation.

Used in drilling, counterboring, spot-facing and reaming operations, these hydraulic power units can be designed into special-purpose machines with easily controlled automatic cycles. Units can later be re-arranged to perform different machining operations.

You can install these power units easily. They'll stand up under fast cycles and continuous operation; they're self-lubricated.

For complete information ask your Ex-Cell-O representative or write Ex-Cell-O in Detroit.

EX-CELL-O CORPORATION DETROIT 32, MICHIGAN — EX-CELL-O FOR PRECISION — XLO — 57-12

MANUFACTURERS OF PRECISION MACHINE TOOLS GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 156

A Complete Line of Single, Gang, and Automatic Duplex Slitters is featured in a new 12-page catalog. Also covered are a scroll shear for medium and high speed can making lines. Illustrated and described are a body blank stacker, motor-driven grinding

attachment, and a full line of slitter accessories. In addition, design and construction features of all machines are included and dimensions listed. Copies of Section 1, Catalog 36-B, can be obtained by writing to E. W. Bliss Co., Canton 10, or — **Circle Inform-A-Gram No. B25.**

Cut Faster and Clear Chips Better with new DME end mills. A bulletin covers both two and four flute end mills. The two-flute end mills have been redesigned to give more cuts/grind, consistent accuracy, faster production and greater economy. The four-fluted center cutting end mills offer economical milling for the required deep plunge and pocketing cuts. Copies of the bulletin containing speed and feed data and details are supplied by Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12, or — **Circle Inform-A-Gram No. B26.**

Universal Balance Positioners are the subject of Bulletin UB57 released by Aronson Machine Co., Arcade, N. Y. Detailed are five models with capacities of 25 to 2,000 lbs. Also included in the bulletin are schematic drawings, operating instructions, complete specifications, and optional accessories. Write to the company for your copy, or — **Circle Inform-A-Gram No. B27.**

Type E Relays with Universal Mounting are now available from Stromberg-Carlson Co., 100 Carlson Rd., Rochester 3, N. Y. The relays are described complete with specifications and mounting diagrams in a circular. Also given is ordering information. For your copy of the circular, write to the company, or — **Circle Inform-A-Gram No. B28.**

REPEATED ACCURACY WITH Em-re DIAL INDICATORS

THE MOST ACCURATE MADE

Patents Pending.

The "Em-re" Dial Indicator will give you greater accuracy, greater repeatability and longer service-life than ever before possible. This precision performance results from a unique combination of design features: the "Em-re's" simple, unit construction consisting of only 31 parts, 25 of which are interchangeable and common to all models — a fully jeweled gearing mechanism — and a completely shockproof system, throughout the *entire* range, that *actually contributes to* the measuring accuracy obtained. Rigid testing with millions of severe impacts has failed to impair even slightly this repeated accuracy (to better than .00002" in .00005" and .0001" indicators). Stocked in 26 models, 8 ranges from .002" to 1.000"; graduations in .00005", .0001", .00025", .0005" and .001". *Also available for accurate indicator testing — The "Master" Dial Indicator Checker.*

Write for Catalog E.

PETZ-EMERY INC.
PLEASANT VALLEY, NEW YORK

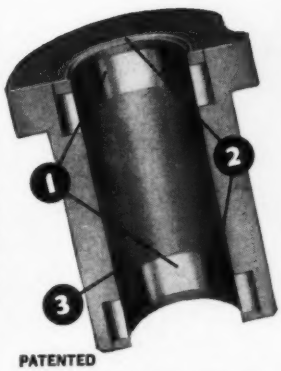
CIRCLE INFORM-A-GRAM KEY NO. 1571

MEYCO CARBIDE INSERTED DRILL JIG BUSHINGS PROVE THEMSELVES *IN Automation!*

The reason is simple: these unique bushings are ideally suited for long-running, uninterrupted operations!

MEYCO carbide inserted bushings assure long life for drills, jigs, fixtures . . . accurate work maintained, resulting in less down-time, fewer lost man-hours. Last almost as long as solid carbide bushings, cost slightly more than ordinary bushings. Get the full story:

Write for information and price list, ask for Catalog No. 41.



PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

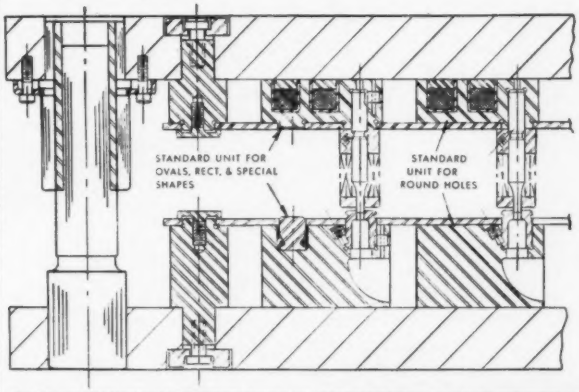
EST. 1888

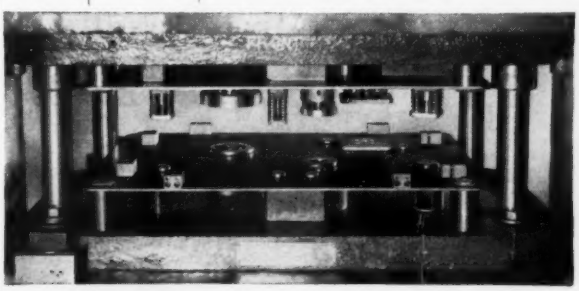
W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1572

MAGNETIC DIES by WHISTLER

• Operate like a single-purpose die • All punch and die parts interchangeable • Pierce metals up to ¼" thick steel • Changes made from one operation to another while the die set is in the press • Change-over time from 5 to 20 minutes, depending upon size of die set • Lower die costs • Saves die storage space • Precision work in any size press • Backed by Whistler's 40 years of die making experience serving the nation's leading plants.





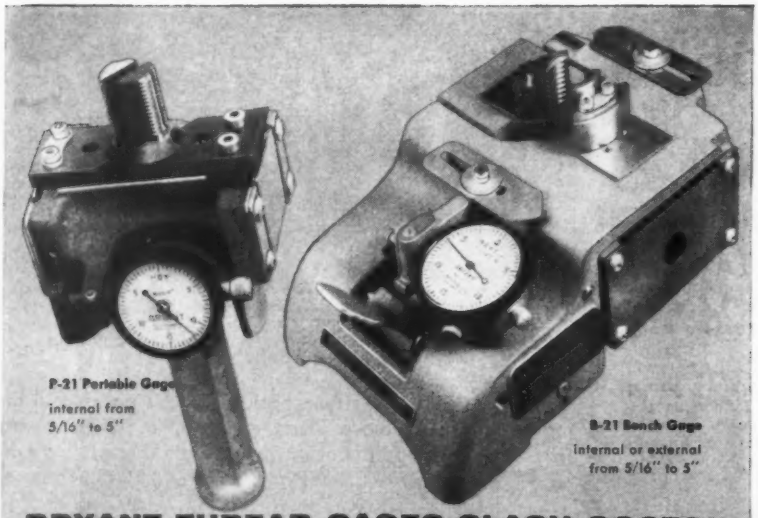
YOU NEED THIS CATALOG... Shows by photos, drawings and prices how the Magnetic Die* system drastically cuts die costs, saves valuable time, speeds production. *Write for it today.*

**Whistler Magnetic Dies are fully patented and are sold under the registered trade name Magna-Die.*

S. B. WHISTLER & SONS, INC.
748 Military Road, Buffalo 23, N. Y.

ADJUSTABLE, MAGNETIC and CUSTOM DIES FOR ALL INDUSTRY
Direct Factory Representatives Located in Principal Industrial Areas

CIRCLE INFORM-A-GRAM KEY NO. 1573

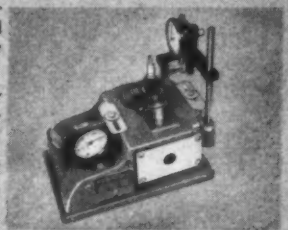


BRYANT THREAD GAGES SLASH COSTS!

Check these important features!

- **WEARABILITY** 10 to 20 times longer life than conventional plugs and rings!
- **SPEED of GAGING** 8 to 10 times faster than conventional plugs and rings!
- **SIZE CLASSIFICATION** permits the use of statistical quality control methods, — allows process inspection at the machine or at final inspection — positive classification by giving exact readings on every piece.
- **EASE of OPERATION** thumb lever collapses segments — rapid no wear loading.
- **VERSATILITY** Attachments for checking squareness of face, concentricity and other specialized applications.

WRITE FOR COMPLETE INFORMATION


Concentricity Attachment

Bryant Gage & Spindle Division
P. O. Box 620-F, SPRINGFIELD, VERMONT
Division of Bryant Chucking Grinder Company

CIRCLE INFORM-A-GRAM KEY NO. 1581

CIRCLE INFORM-A-GRAM KEY NO. 1583

.0003 HOLE LOCATION IN 1 MINUTE

EDGE FINDERS

$2.50 NEW — POSTPAID except C.O.D. — $10.00 DELUXE

- THOUSANDS HAVE PROVEN AND ACCEPTED THE DELUXE MODEL FOR YEARS.
- JUMPS SIDEWAYS AS SHOWN WHEN LOCATION IS REACHED.

◄ NEW .500 DIA. MODEL FOR LARGER WORK ONLY. .200 Dia.►

ADJUSTABLE VISE STOP

$2.95

HUNDREDS OF PIECES TO A .0003 TOLERANCE WITH THIS HARDENED VISE STOP THAT IS ADJUSTABLE IN ALL DIRECTIONS. ATTACH TO VISE WITH ONE ¼—20 TAPED HOLE.

Dealer Inquiries Invited

GLOVER MFG. CO.
422 Park Ave. Meadville, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 1584

Now ANGLE TANGENT TO RADIUS WHEEL DRESSING WITH NEW VERSATILE TOOLS

MIGHTY GOOD AT ANY PRICE BUT TOPS AT ONLY $149.50
(Both tools including diamonds)

The G-5 RADIUS DRESSER is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on a 7 inch or 10 inch wheel, and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation. The G-2 ANGLE DRESSER AND TOOL HOLDER is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up small jobs to be milled, drilled, tapped, etc., on any desired angle.

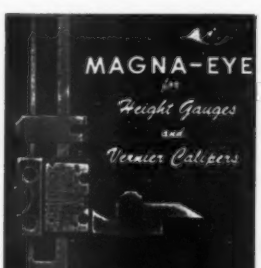
Our fixtures will dress most radii and angles tangent to each other, similar to those shown below.

FREE handsome, wooden storage box. Write for complete information.

Distributorship available in select territories.

ROTHFUSS TOOL COMPANY
BOX 22, ELMWOOD STATION PROVIDENCE 7, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1582



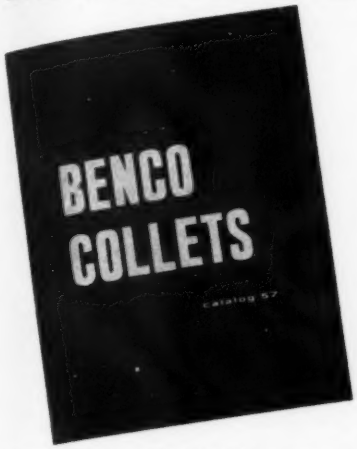
MAGNIFIES "HARD-TO-READ" VERNIER SCALES ON HEIGHT GAGES AND CALIPERS

MAGNIFIES the "hard to read" vernier scales on calipers and height gages. No more eye strain, guess work or hit or miss setting and reading. **LENS** is finest quality optical glass, specially designed and ground for the purpose with utmost optical skill. 4X magnification shows lines true and correct. In daily use in plants of Westinghouse, General Electric, General Motors, Chrysler, Packard, Ford, Boeing Aircraft, Bendix Aviation and many others engaged in defense work.
Made in 3 sizes to fit Starrett, Brown & Sharpe, Lufkin Tools, and others of similar design. 3 No. 100 for 6" Vernier Calipers; 3 No. 200 for 10"-12" Height Gages, also 10"-18"-24" Vernier Calipers; 3 No. 300 for most popular type 18" and 24" Height Gages and for 36"-48" 60" and 72" Calipers.
For Complete Information Write, Phone or Wire

STEBAR COMPANY
215-221 28th Ave. North Minneapolis 11, Minn.

CIRCLE INFORM-A-GRAM KEY NO. 1585

Collets, Pushers, Feed Fingers, and Pads for all types of screw machines are included in Benco Catalog 57 issued by Balas Collet Mfg. Co.,



Cleveland 14. Also listed in the catalog are lathe collets. To obtain a copy of the catalog, contact the company, or —
Circle Inform-A-Gram No. B29.

"How Much Can You Save through Fastener Standardization?" This booklet shows how to consolidate fastener types and sizes used and how "in-stock" standards can often replace "made-to-order" standards or specials. Several case histories are included in the booklet to show the savings possible. For complete details, get the booklet from Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago 50, or —
Circle Inform-A-Gram No. B30.

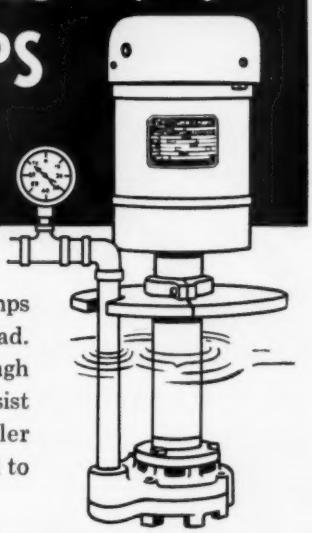
The Squar-Vise is highlighted in a new bulletin prepared by Kearsarge Tool & Mfg. Co., R. D. 3, Erie, Pa. It fills the need for a universal holding fixture with the accuracy of an angle plate and provides an improved method of clamping a workpiece over conventional machine vises. The Squar-Vise is equipped with two quickly removable and infinitely positionable clamps. The bulletin describes the Squar-Vise, shows typical setups and lists the dimensions, weights and prices.
Circle Inform-A-Gram No. B31.

Chart Operational Data with visual industrial control systems produced by Visi-trol Engineering Co., 9345 Hubbell, Detroit 28. A bulletin describes how the systems reduce record keeping, and increase efficiency by sight-recording complete sets of facts to control production, scheduling, inventories, etc. Copies of Bulletin IC-1156 containing standard sizes, specifications and prices, and showing typical systems and construction features are supplied by the company, or —
Circle Inform-A-Gram No. B32.

Non-Lubricated Bearings made from carbon-graphite material are the subject of a 12-page illustrated catalog. The bearings operate under very high temperatures and are chemically inert. Included in the catalog are properties, load rating charts, standard grade and application data sheets, and actual operations where the bearings are being used. Get your copy of the catalog from Electro-Nite Carbon Co., 8601 Torresdale Ave., Philadelphia 36, or
Circle Inform-A-Gram No. B33.

The Operational Characteristics and mechanical details of a line of electric fork trucks are pointed out in a new eight-page brochure. The four major components of the trucks are described through photos, sketches, and cut-away drawings. Features such as pivoted steer axle and three independent braking systems are discussed. Copies of the catalog are provided by Clark Equipment Co., Industrial Truck Div'n, Battle Creek, Mich., or —
Circle Inform-A-Gram No. B34.

Need Pressure AND Volume? these GRAYMILLS Superflo COOLANT PUMPS give you BOTH!



These compact, dependable coolant pumps can give you up to 10 GPM *at* 65 ft. head. They provide abundant flow even through a maze of pipes and fittings. They resist wear and binding because the impeller floats on a cushion of liquid – no metal to metal contact, no seals, no packing.

Even if you don't need this "high head" performance, you'll find Standard Superflos for every normal need from 1/25 to 1½ H.P.

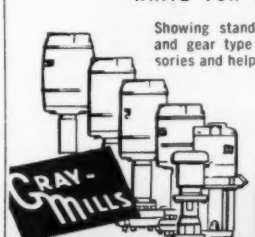
Model 30JH-1 1 HP – Various Lengths. 10 GPM at 65' head. Amazingly compact. Interchangeable with ¼ HP Models.

145

Pumps only or complete pumping units with tanks. Sold by leading Industrial Distributors everywhere. Graymills representatives near you are ready to help with special problems.

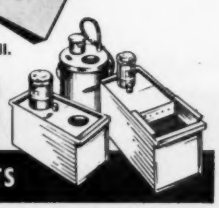
WRITE FOR THIS NEW CATALOG 56JH

Showing standard and JIC model centrifugal and gear type Pumps, Pumping Units, Accessories and helpful selection chart.



GRAYMILLS CORPORATION
3713 N. Lincoln Ave., Chicago 13, Ill.

GRAYMILLS



Superflo COOLANT PUMPS AND UNITS

CIRCLE INFORM-A-GRAM KEY NO. 159

Flexible Polyamide Pressure Tubing is detailed in new Bulletin BR-3A from The Polymer Corp. of Pennsylvania, Reading, Pa. Described are the outstanding characteristics and installation advantages along with available sizes of Nylaflow tubing. Also included are pictures and operating instructions for the new installation tools. Nylaflow tubing can be used for lubrication, hydraulic, pneumatic, fuel, and instrumentation lines.
Circle Inform-A-Gram No. B35.

Pre-Assembled Stacks of Belleville Spring Washers are described in a six-page bulletin published by Associated Spring Corp., Bristol, Conn. Exploded views show how the washers are assembled to form compact energy cartridges. Schematic drawings illustrate several typical applications for these cartridges, which can be incorporated as one-piece components in the final machine and are easier to handle than loose washers.
Circle Inform-A-Gram No. B36.

Conventional Types of Diamond Dressing Tools are illustrated and described in a folder released by Craine-Schwartz Diamond Tool Co., 8100 Lyndon, Detroit 38. Included are single stone dressers for general grinding operations; sidemount, concave and formed concave dressers for radius forming work; and copycat and blade type tools for form dressing steps and other irregular profiles. Also detailed are shaped diamond tools for reproducing the root sections of jet blades and buckets, and a variety of multiple stone and diamond impregnated tools.
Circle Inform-A-Gram No. B37.

Precision, Mass Production Barrel Finishing of ferrous and non-ferrous castings, die castings, steel forgings, and screw machine parts is performed by Tumbrade-40 abrasive chips and triangular media. The

chips are available in 15 sizes and the triangles in 4 sizes. A bulletin provides complete specifications and discusses the advantages. Get your copy of the bulletin from Macklin Co., Dept. 27, Jackson, Mich., or —
Circle Inform-A-Gram No. B38.

Automatically Solder Up To 10 Brazings at a time with one operator using the Braze-O-Matic soldering unit. It is adaptable to all forms of soldering, including aluminum and powdered metal. The unit and its design features are detailed in a four- page brochure published by Castle Machines, Inc., 1049 E. 20th St., Erie, Pa., or —
Circle Inform-A-Gram No. B39.

Higher Cutting Speeds and Rates of Feed are possible using the Du-Bore. This tool, a counterbore with welded tungsten carbide, can be used in all metals. It is unaffected by the highest cutting temperature. Coffey-Cummins Mfg. Co., Pasadena 3, Calif., will supply copies of a circular with details, or —
Circle Inform-A-Gram No. B40.

ARE YOU USING- HOVIS UNIVERSAL Master COMPOUND DIES

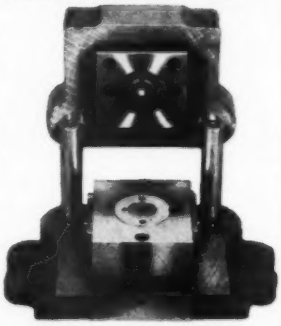
to Produce WASHERS and SMALL STAMPINGS from all Types of Materials the ECONOMICAL WAY?

SAVES DESIGNING COST TIME • LABOR MATERIALS STORAGE SPACE

The "MODERN METHOD" adopted by MANUFACTURERS NATIONALLY

NO NEED TO MAKE A NEW DIE FOR EVERY STAMPED PART

● By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.



Made in 5 sizes:
¾" - 1½" - 2½" - 4" - 6"

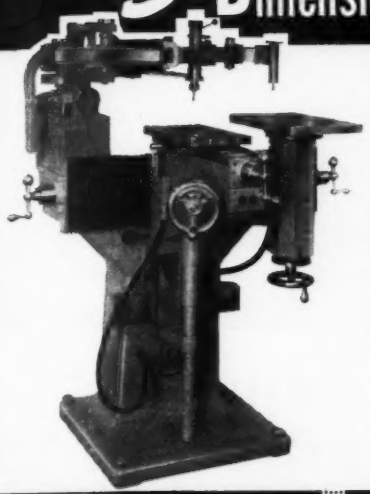
Specialists in designing and manufacturing MULTI-DIES as well as supplying COMPLETE TOOLING FOR ALL SIZES OF NUT FORMERS

Write for Literature

HOVIS SCREWLOCK COMPANY
8100 E. NINE MILE ROAD • BOX G • VAN DYKE, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit

CIRCLE INFORM-A-GRAM KEY NO. 160

3-Dimensional panto-miller



For accurate pantograph milling on all 3-dimensional work, the "Panto-Miller" 3A is a sturdy production machine. Accurately reproduces copy on flat or curved surfaces, in reduced or magnified size.

NEW:

Capacity for workpiece height.
Sensitivity of linkage.
Range of pantograph ratios.
Accuracy of reproduction.
Finger-Tip Control of spindle speeds.
Ease of operation.

The new Panto-Miller 3A is an economical answer to many standard *and* special production problems. Write for Bulletin PM3, which gives details and specifications.

2-Dimensional panto-miller

Versatile and dependable for continuous service, the J & B "Panto-Miller" 2A:

Engraves
Profiles
Die Cuts
Mills

Special Model 2B with 60" tracer arm available for low cost production of metal stamping dies.

Send for Bulletin PM2

3-WAY Indexing Trunnion

Simple, Rapid, Positive positioning of workpiece or jig for all angle Drilling, Tapping, or Counterboring. Available with Chuck, Faceplate, or Right-Angle Adaptor Plate. Complete with Station Selector. For details, ask for Bulletin 173.

WITH RIGHT ANGLE ADAPTOR

WITH FACE PLATE

AVAILABLE SIZES 7", 10", 14", 18", 24"

J&B EST 1870

JOHNSON & BASSETT, INC.
PRODUCTION TOOL DIVISION
WORCESTER, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 1611

MELCO CENTER POINT **LUBRICANT**

SOLD IN TUBES, QUARTS, GALLONS, DRUMS

Made in both oil and grease form . . . designed for use on lathe and milling machine centers; grinding machine centers; steady rests and heavy journals; tapping, broaching and extruding; any application where extreme pressure or frictional heat prevails. Reduces frictional heat . . . thus an excellent additive for cutting, broaching or drawing oils.

SEND TODAY FOR FREE SAMPLES

C. B. TEETER 4470 OAKENWALD AVE., CHICAGO, ILL.
Phone DRexel 3-3571

CIRCLE INFORM-A-GRAM KEY NO. 1612

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 1613

HOLD IT!

FIRMLY BUT GENTLY

WITH WOODWORTH CHUCKING EQUIPMENT

Our tough looking character who is holding the smiling baby clearly demonstrates one fact whenever you are holding anything it should be secured with gentle firmness. And this is so true when considering chucking equipment.

Your best machine will produce only as accurately as its work-holding device permits and Woodworth manufactures the most rugged, accurate and dependable chucks for precision machining in America.

We invite your inspection and consideration of N. A. Woodworth products. There is a Woodworth Sales Representative in your area and a letter to the N. A. Woodworth Company will place him promptly at your service.

"Accuracy you can trust"

WOODWORTH
1300 East Nine Mile Road
Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1614

SPECIFY GRIPCO LOCK NUTS

to resist stress, wear and vibration

They increase product durability at low initial cost

Simple one piece design — no inserts — no outside devices. Nothing complicated — the Gripco locking action is within the nut itself, yet you get low initial cost and low application cost with increased customer satisfaction. Speed production and lower manufacturing costs on your products now.

Send for samples and full particulars.

Gripco Products Include:

Gripco Lock Nuts • New Gripco "Clinch Nuts" Gripco Hi-Nuts • Gripco Pilot-Projection and Countersunk Weld Nuts

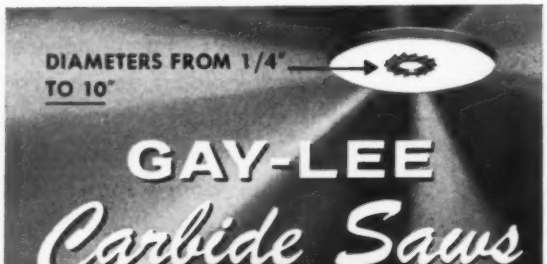
all with or without the famous Gripco positive locking feature. Also Standard Semi-Finish Nuts.

115

GRIP NUT COMPANY

107 Maple Ave. • South Whitley, Ind.

CIRCLE INFORM-A-GRAM KEY NO. 1621



AS THIN AS YOU NEED FOR SLITTING, SLOTTING, SAWING

Make tough production problems easy with the Gay-Lee carbide-tipped "Thinsaw." Even when wafer-thin for the most delicate work, these saws provide positive alignment and rigidity that allow cutting free of run-out to full depth. Carbide tips for speed and long life, expertly brazed into a specially designed, patented seat that secures them firmly. Thickness as low as .030", thickness tolerances can be held to .0001", diameters ¼" to 10". Send details of your problem for recommendations and quotations.

GAY-LEE COMPANY

CLAWSON • MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1622

Systematic "NTS" salvage is the best way to cut cutting tool costs

Stop before you discard a worn or damaged cutter. It may be worth many times its scrap value!

Since 1912 we have been restoring all kinds of cutting tools to new usefulness to help shops control their cutter costs.

Can we assist you in studying your operations and tool usage to determine if a salvage program will save money in your plant? There is no obligation.

Write for this catalog and the salvage story.

NATIONAL NTS TOOL SALVAGE

NATIONAL TOOL SALVAGE CO.

6511 EPWORTH BOULEVARD DETROIT 10 MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1623

A Complete Line of Horizontal, Multi-Station, Automatic Redraw Presses is described in Circular 926-M-4 issued by Waterbury Farrel Foundry & Machine Co., Power Press Div'n, Waterbury, Conn. They are used for quantity production of straight and shouldered deep shells in a wide variety of sizes and shapes. Covered are 13 machines with 5 to 12 stations having blank length maximums ranging up to 9", with production rates to 100 shells/min. One section is devoted to special attachments.
Circle Inform-A-Gram No. B41.

A Series of 15 New Blue Data Sheets on Carmet carbide grades is now being distributed by Allegheny Ludlum Steel Corp., Carmet Div'n, 1500 Jarvis Ave., Detroit 20. The sheets are keyed with different colored bands across the bottom to indicate each grade's function. Each gives typical applications, analysis, and physical characteristics. In addition, there is a series of charts on most of the sheets, giving transverse rupture, electrical conductivity, and resistance to abrasion.
Circle Inform-A-Gram No. B42.

A New Line of Pilot Operated Poppet-Type Air Control Valves is featured in Catalog 105 from Galland-Henning, Nopak Div'n, 2787 S. 31st St., Milwaukee 46. The valves described are available for 2-, 3-, and 4-way operation with master (air), single or double solenoid pilot control. Presented is complete dimension, installation, application, and operation data.
Circle Inform-A-Gram No. B43.

A Complete Line of Flat Twisted and Rolled Section High Speed Drills is included in a new catalog-folder put out by Hi-Duty Drill Works, Fleetwood, Pa. The diameters, lengths, and proper uses of the drills are listed, showing the sizes from ½" to 3¼" and larger sizes, which are available from stock. Also shown are milled type drills from 1/64" to ½" dia.
Circle Inform-A-Gram No. B44.

Perform a Wide Range of Difficult Drilling and Tapping Operations with the Mag-Tool magnetic drill press. Its micromatic adjustment permits precise positioning of the drill bit after a drill press has been magnetically attached to the working surface. A bulletin lists the models available complete with photos and specifications. Also covered are magnetic plate clamps. Copies of the bulletin containing details are made available by Magnetic Tool Corp., 1955 Lafayette St., Santa Clara, Calif., or — **Inform-A-Gram No. B45.**

Prevent Waste and Cut Grease Residue to a Minimum with follower plates. They remove lubricants down to the bottom of 400-lb containers, working down flat and evenly across the top of the grease. The follower plates are available for Alemite 7700 Series, and H and Super H high pressure barrel pumps. For further details, obtain a copy of Circular 22-23 from Stewart-Warner Co., 1826 Diversey Pkwy., Chicago 14, or —
Circle Inform-A-Gram No. B46.

Cut Production and Maintenance Costs with Bux portable magnetic drill presses. They now feature an infinitely variable switch for easier positioning. A folder shows each of the models available, complete with a description, and lists the specifications. Also covered are magnetic plate clamps and a magnetic drill vise. Buck Mfg. Co., 1355 N. 10th St., San Jose, Calif., will supply copies of the folder, or —
Circle Inform-A-Gram No. B47.

J&L

REVOLVING TANGENT DIE HEADS

. . . for multi-spindle automatics; drill presses; special machines

- Chasers can be changed in a few seconds without disturbing the die head or *holders*
- Positive, automatic tripping permits threading close-to-shoulder on every piece
- One set of holders handles a full range of coarse, fine and multiple threads

CLASS III THREADS GUARANTEED . . . EVERY TIME

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Solid Adjustable Taps
Automatic Opening Stud Setters
Modern-Magic Chucks & Collets
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Class III Guaranteed Not Sometimes, but Everytime!

JONES & LAMSON MACHINE COMPANY, 521 Clinton St., Springfield, Vt., U.S.A. J&L THREAD TOOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 163

Remote Printing of Identifying Marks on Strip Charts is performed by Identicharts. They record on strip charts from a remote point the exact time or sequence conditions occur during process control and test work. A folder describes the Identicharts and related equipment, together with a sample of the identifying marks each makes. For your copy of the folder with details, contact Royson Engineering, Hatboro, Pa., or —
Circle Inform-A-Gram No. B48.

A Drafting Room Check-Up List has been published by Frederick Post Co., 3630 N. Avondale Ave., Chicago 18. It covers equipment and supplies, featuring items to help increase drafting efficiency. In addition, the brochure suggests specific ways to cut down waste motion, eliminate time-consuming methods, reduce fatigue, and save space. Direct requests for the check-up list to the company, or —
Circle Inform-A-Gram No. B49.

67 Different Types of Zinc Alloy Die-Cast and Thermoplastic Mold Products are listed in a bulletin from Gries Reproducer Corp., 125 Beechwood Ave., New Rochelle, N. Y. The first section deals with zinc alloy die-cast and thermoplastic molded small parts to customer's specifications. The second section covers standard zinc alloy die-cast stock products, divided into four major types of application. Request copies of the "Services and Products Bulletin," from the company, or —
Circle Inform-A-Gram No. 50.

Heat Treating Equipment is the subject of Bulletin 461 now available from C. I. Hayes, Inc., 800 Wellington Ave., Cranston 10, R. I. The design advantages and available sizes of the company's line of hardening, preheat, high speed steel, tempering, and vertical furnaces is described. Also covered are Certain Curtain atmosphere and its features, as well as endothermic atmosphere generators.
Circle Inform-A-Gram No. B51.

"Finger Tip Facts on Cleveland Worm Gear Drives" provides information on the complete standard line produced. Covered are speed reducers, worm gear sets, and special units. Each is pictured and described. Also included are integrated assemblies and worm gearing components. For details, see Bulletin 145 prepared by The Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland 4, or —
Circle Inform-A-Gram No. B52.

The Design and Construction of Series 900 Milling Cutters are described in a new bulletin. These cutters feature Super-Jack locking wedges for milling with square and triangular indexable throw-away carbides. Listed are dimensions and other specifications. The cutters are available in eight sizes of shell end mills, eight standard sizes of face mills, and special made-to-order sizes. Write to McCrosky Tool Corp., Meadville, Pa., for copies of Bulletin 572, or —
Circle Inform-A-Gram No. B53.

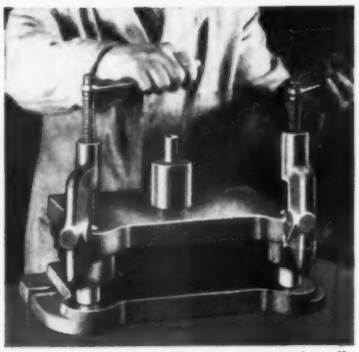
The Engineering Properties and Fabrication Characteristics of 10 high-strength alloys for elevated temperature service are found in a 20-page booklet. Included are physical constants, mechanical properties at room and elevated temperatures, heat treatment, forging, cold working, welding, and corrosion resistance. Recommended uses are indicated for each alloy. Requests for copies of the booklet should be sent to The Carpenter Steel Co., 306 W. Bern St., Reading, Pa., or —
Circle Inform-A-Gram No. B54.

FOR EASY, FAST, UNIFORM SEPARATION OF DIE SETS . . .

Use These Acro Pullers

When you have die set pullers that remove the punch holder from the die shoe by a straight upward pull and the punch holder slides upward from the die shoe simultaneously from both leader pins, you have Acro Die Set Pullers and you're saving time.

If you're not, this is how it's done with Acro Pullers: *Indexed* screw wrenches act as indicators, controlling the upward travel. This is an exclusive patented Acro feature and found only in ACRO DIE SET PULLERS. It may pay you to investigate. Write for further free information today.



Separate die sets with even upward pull.

Die sets separate evenly and smoothly.

Eliminate wear on Die Sets with ACRO Leader Pin Oilers

Oilers fit over each leader pin, seal in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Write for additional information.

OTHER ACRO TIME SAVERS FOR YOUR SHOP include drill rod racks, wing nuts and lubricators. Write for complete descriptive folder. Ask for DP-57.

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336 E. RESERVOIR AVE., MILWAUKEE 12, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 164

HEATS FAST SAVES TIME

johnson

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Start heat treating high speed and carbon steels while other furnaces warm up. Powerful burners in this efficient furnace get heat up to 1300°-2350° F. range in minutes. Temperatures accurately and quickly regulated. Ratchet-operated door opens upward — no need to open fully every time. High temperature refractory-lined firebox keeps heat uniform — 7" by 13" by 16½". 200,000 BTU's per hr. Carbofrax hearth, G.E. Motor and Johnson Blower included ..... F.O.B. Factory, $337.00

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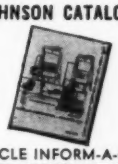
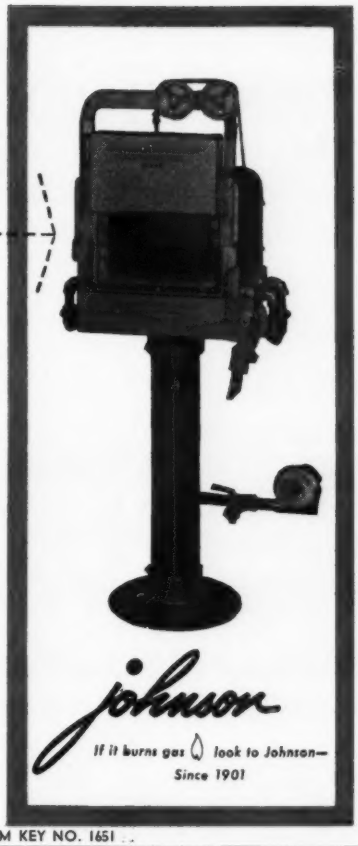


Johnson Gas Appliance Company
575 E. Avenue N.W.,
Cedar Rapids, Iowa



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FORD

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Rotary FORD Tools

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give you . . . at lower cost . . .

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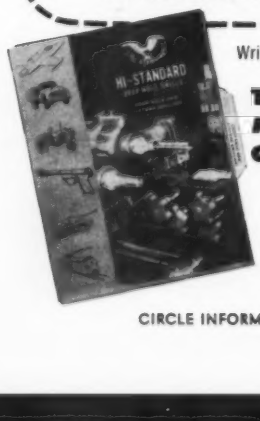

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Procunier heads are noted for their *superior quality.* They offer a new double cone cork faced friction clutch for positive "controlled" driving with finger tip pressure; soft cushioned driving action, ball bearings for smoother, faster operation; heat treated gears; and special balanced reversing mechanism; plus many others. It all adds up to *more* production, *better* production, for *longer* periods, for *less.*

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CIRCLE INFORM-A-GRAM KEY NO. 1663

Stud Drivers are highlighted in a bulletin from Remington Arms Co., Inc., Bridgeport 2, Conn. Described and illustrated are Model 455 and Mighty-Mite Model 456. Given are operating instructions, power loads, features, and specifications. A table shows the various types of ¼" and ⅜" studs available. Also contained in the bulletin is a section on special guards.
Circle Inform-A-Gram No. B55.

A Guide to Selecting and Operating Di-Acro Shears is the manual prepared by O'Neil-Irwin Mfg. Co., 300 - 8th Ave., Lake City, Minn. The shears will cut square, rectangular, and other straight sided blanks; shear narrow strips; and trim the edges of sheets and parts. The specifications and capacities are listed in reference table form. The company will fill requests for the shear instructions manual, or —
Circle Inform-A-Gram No. B56.

Supervision, Inspection, and Production Operations are handled by engineered quality control equipment produced by Visi-trol Engineering Co., 9345 Hubbell, Detroit 28. Bulletin QC-1056 includes the standard sizes and prices of free-standing portable inspection cabinet assemblies, and eye-level quality control chart stands and chart holders. Also covered are self-stacking steel storage racks and portable rotating storage drums for line storage, conveyor carrier or in-process operations.
Circle Inform-A-Gram No. B57.

The Advantages of Featherweight Aircraft Huckbolt Fasteners are presented in Catalog 8-350 from Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7. Covered are SAL and SLS fasteners, both pin and stump types. Also listed is technical data such as allowable tension, allowable shear, pin and collar specifications, drilling procedure, and rate of installation. In addition, detailed dimensional data is listed for the complete range, and pneumatic and hydraulic driving tools for use with the fasteners are shown.
Circle Inform-A-Gram No. B58.

Both Cast and Sintered Alnico Permanent Magnets are covered in 12-page Catalog PM-121 from Metallurgical Products Dept., General Electric Co., Detroit 32. Included is information on magnetic and mechanical properties, approximate tolerances, magnetic assemblies, and ordering information. Illustrations and engineering data provide information on the various shapes available.
Circle Inform-A-Gram No. B59.

Maximum Resistance to Vibration is provided by standard threaded fasteners treated with Loctite sealant. The sealant wicks into the engaging threads and hardens automatically to form a tough heat and oil resistant plastic. It is available in four strengths which control the grip of the fasteners. American Sealants Co., 103 Woodbine St., Hartford 6, Conn., will supply copies of a bulletin containing details, or —
Circle Inform-A-Gram No. B60.

Thread Chasers and Thread Chasing are discussed in Bulletin 118 from Chaso Tool Co., Inc., Box 268, North Branch, Mich. Included are screw thread and thread chaser terms, chaser grinding instructions, and a chaser face grinding chart. Also included is a table of threading speeds and a section on common thread troubles and their correction. For further information, see the bulletin prepared by the firm, or —
Circle Inform-A-Gram No. B61.

WORLD WIDE *Acceptance*

INDEX

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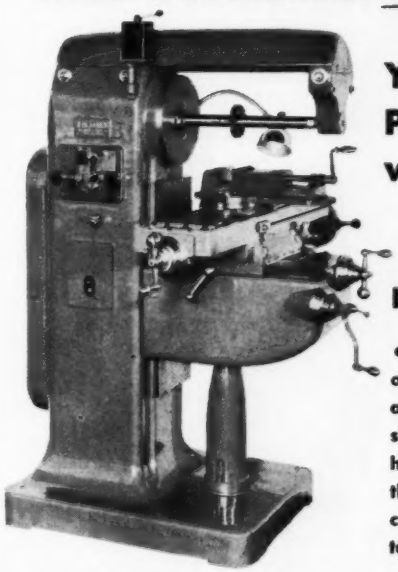

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The INDEX LINE also includes the Famous "SUPER 55" and the Popular "45" Vertical Mills

Write for Literature

INDEX MACHINE CO.

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CIRCLE INFORM-A-GRAM KEY NO. 167

Power Operated Machines for Plate and Sheet Metal Work are highlighted in an illustrated 40-page pocket-size booklet. Included is data on each series in the line and basic specification charts. For complete information on individual lines or machines, references are made to specific bulletins. Obtain copies of Booklet 203 from Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, or —
Circle Inform-A-Gram No. B62.

Move Loads from 1,000 to 6,000 Lbs with the Multiton Junior roller skid. A data sheet describes the roller skid and lists specifications. In addition, five typical applications of the heavy duty dolly are presented. In combination, they are ideal for movement of many machine tools and heavy equipment. To obtain copies of the data sheet, contact Stokvis-Edera & Co., Inc., 18 Secatoag Ave., Port Washington, N. Y., or —
Circle Inform-A-Gram No. B63.

The Hydro-Cycle Contour Mill is designed to perform contour milling operations easier, in a broad range of metals, with an exceptional degree of accuracy. It uses an 18" cross travel and a vertical travel of 12", and is available in standard longitudinal travel lengths of 32", 42" and 48". A bulletin, in addition to describing the mill, shows a typical job it has handled and lists the features. The Colonial-Romulus Div'n, Colonial Broach & Machine Co., Parkgrove Sta., Detroit 5, will make available copies of Bulletin CRH-57, or —
Circle Inform-A-Gram No. B64.

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MICROMETER ADJUSTABLE REAMERS

Typical Applications:
- LATHES • TURRET LATHES
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Type S for through hole reaming.
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Range in Sizes: ¾" to 8" in only 18 units

Type SO for through hole reaming only—range from ½" to ¾" in ONLY 5 Sizes.

• The initial cost of a Wickman-Brown reamer is your last major expenditure. The blades, available in both high speed steel and tungsten carbide, are precision ground and may be sharpened repeatedly without affecting micrometer reading.

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Down time is eliminated on production due to micrometer adjustability without removal of blades or unit from machine.

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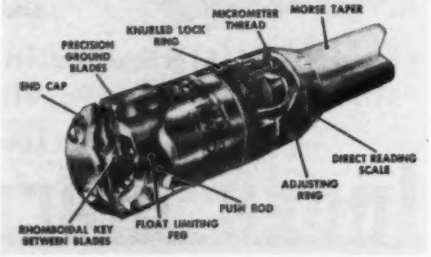

THE Wickman MANUFACTURING CO.
10329 CAPITAL AVENUE (OAK PARK) DETROIT 37, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 168

Low Cost Production Cutoff Efficiency is provided by the C-12 power saw. It is ideally suited to applications where hard, tough and expensive steels must be machined accurately and with a minimum of waste. A brochure presents a chart showing cutting rates and tool costs for machining of most carbon and alloy steels. Copies of the brochure, Form 56-62, are issued by The DoAll Co., Des Plaines, Ill., or —
Circle Inform-A-Gram No. B65.

Solid Carbide Tools are featured in a new brochure from R. L. Schmitt Co., Allen Park, Mich. Included are solid carbide reamers, internal grinding tools, center laps, drills, rotary files and burrs, end mills, and plug gages. Each is shown and described, and the specifications listed. Contact the company for copies of the brochure, or —
Circle Inform-A-Gram No. B66.

Precision Metal Stampings and Deep-Drawn Parts are illustrated and described in Bulletin 80 published by Johnson & Hoffman Mfg. Corp., 31 E. 2nd St., Mineola, N. Y. The company has facilities to produce a wide variety of parts to exacting close tolerances. The bulletin, in addition, lists 17 materials used in the production of the parts.
Circle Inform-A-Gram No. B67.

High Load Capacity and Long Service Life are features of ANGLgear standardized right angle bevel gears for manual or powered transmission of rotary motion. They are obtainable with either 1:1 or 2:1 ratios and with either two or three shaft extensions. A bulletin contains line drawings giving the dimensions of the three standard sizes and a table of basic model data lists the rated horsepower and speed for all 12 standard models. Airborne Accessories Corp., 1414 Chestnut Ave., Hillside, N. J., will provide copies of Bulletin 57 with details, or —
Circle Inform-A-Gram No. B68.

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DURANT Ram Scrap Choppers

Operated by press ram, independent of the die. Tool steel blades. Easily installed in any position only two bolts necessary.

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M 1	3"	.062	69.
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CIRCLE INFORM-A-GRAM KEY NO. 1701

No. 5

WRITE FOR DESCRIPTIVE CIRCULAR

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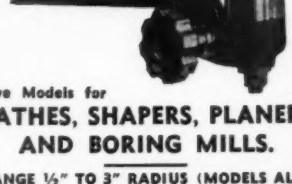

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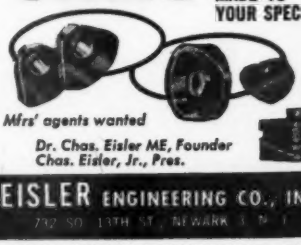

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752 SO. 13TH ST., NEWARK 3, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1705

A Simplified Ordering Catalog is now available from Ace Drill Bushing Co., Inc., 5407 Fountain Ave., Los Angeles 29. Included are the types of sizes of drill jig bushings, both A.S.A. and Ace standard. Technical information is also included. Copies of the catalog are made available by the company, or —
Circle Inform-A-Gram No. B69.

A 16" Geared Head Engine Lathe is the subject of Bulletin A56GH put out by The Carroll-Jamieson Machine Tool Co., Batavia, O. It features 12 geared spindle speeds, a 23⅜" long carriage, and a wide range of threads and feeds. The bulletin detailing the lathe and presenting specifications can be obtained from the company, or —
Circle Inform-A-Gram No. B70.

The Complete J & L Thread Tool Line is covered in a new catalog, Form GL-5701, from Jones & Lamson Machine Co., Springfield, Vt. Described and illustrated are the various types of die heads available, complete with specifications. One section of the catalog is devoted to collapsible taps and quick-change collets. Copies of the catalog are issued by the company, or —
Circle Inform-A-Gram No. B71.

No. 2 Automatic Screw Machine is shown and described in Catalog SM32 from Brown & Sharpe Mfg. Co., Providence, R. I. This new screw machine is available in three different capacities to take stock to ¾", 1¼" or 1½" dia. Its performance on a typical job is also discussed. For copies of the catalog with specifications, operation, and features of the screw machine, contact the company, or — **Circle Inform-A-Gram No. B72.**

Working Pressures to 125 Psi are a feature of Type H-52 industrial vinyl plastic hose. A catalog shows the various applications and advantages of the hose. Also covered are the adapterless swivel fittings that can be used with this hose as well as other air hoses, and filters, regulators, and lubricators. Direct requests for the catalog to Hofmann Engineering Co., 5601 S. Crawford Ave., Chicago 29, or — **Inform-A-Gram No. B73.**

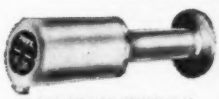
Simple, More Accurate Feed Control is a feature of the improved multiple feed oilers produced by Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12. The leak-proof friction fit of tapered feed adjustment screws eliminates need for conventional lock nuts. The oilers are available with manual or electric solenoid control, and from 1 to 24 outlets. Full details are found in Bulletin 33-A from the company, or — **Inform-A-Gram B74.**

"Subland Cutting Tools" details multi-purpose cutting tools, which are designed to perform a combination of operations such as drill and counterbore, drill and ream, and drill and chamfer. These tools assure more finished work/hr and reduced costs. For complete details on these tools, see the bulletin issued by Detroit Reamer & Tool Co., 780 W. Maple Rd., P. O. Box 174, Birmingham, Mich., or —
Circle Inform-A-Gram No. B75.

A Thread and Form Rolling Machine is highlighted in Bulletin TR-49A released by The National Acme Co., Cleveland 8. Model TR-1 is designed primarily for threading standard solid or hollow parts ranging from the smallest to 1½" dia. The bulletin shows the parts, which can be handled by the machine, its operation, features, and specifications. Complete details are found in the bulletin obtainable from the firm, or **Circle Inform-A-Gram No. B76.**

POPE engineers and builds
20,000
DIFFERENT MOTORIZED AND BELT DRIVEN
SPINDLES
one of which may be just the one to
LOWER YOUR PRODUCTION COST

Here are only a few representative Pope Precision Spindles:



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POPE 1, 2 and 3 HP Totally Enclosed 1800 and 3600 RPM Motorized, Cartridge Type Spindles with double row cylindrical roller bearings of enormous capacity for superior performance and long life, plus separate thrust bearings for no endwise movement of the shaft.

FOR HEAVY DUTY MILLING AND GRINDING

POPE ¾ to 100 HP Direct Motorized Spindles operate in any position — flanged or tapered noses — equipped with super-precision, double-row roller bearings and preloaded ball thrust bearings. Top quality performance is assured on skin milling, grinding, boring and other operations as well as milling.

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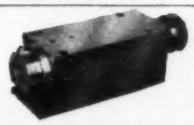

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POPE Heavy Duty Boring Spindles assure smooth, chatter free, continuous high production of accurate parts. Belt driven or motorized, in a wide range of horsepowers and speeds.

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POPE Precision Internal Grinding Spindles have the super-precision bearings to withstand both axial and radial loads and to produce better finished ground holes. Their ability to take heavy cuts means increased production. Wheel life is increased, too. For Bryant, Cincinnati, Excello, Heald, Landis and Norton Grinders.

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POPE Super-Precision, High Frequency, Heavy Duty Spindles are available for speeds up to 100,000 RPM. They are unequalled for low cost maintenance, long life, trouble-free operation and rugged ability to cut metal fast.

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CIRCLE INFORM-A-GRAM KEY NO. 171

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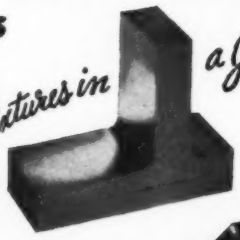
JIG and FIXTURE COMPONENTS

Complete Line—Over 500 Parts

"T" ANGLE PLATES

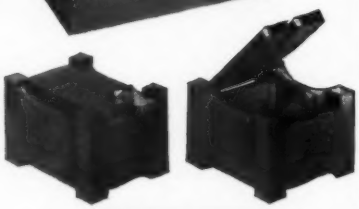
Fixtures in a Jiffy!

Our "T" Angle Plates have many applications as milling fixtures, comparator stands or drill jigs. The addition of a few special parts make this a complete fixture at little cost. Normalized and precision machine castings. Full scale sheets of 7 standard sizes will be included with your catalog if requested.



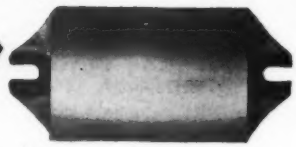
BOX JIGS

Box Jigs shown are made in either square or rectangular style in 9 sizes. Have them on hand in several sizes, use them, and watch your profits mount.

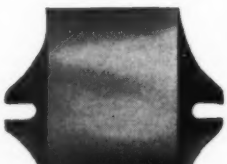


MILL FIXTURE BASES

The Mill Fixture Base shown on top is available in four sizes, the Gang Mill Fixture Base in three. Both are furnished with either standard keyways or jig-bored holes for "Sure-Lock" Fixture Keys at no extra cost. These normalized bases are precision ground, parallel top and bottom with one side finished parallel to the keyways, eliminating the delay and expense necessary in obtaining patterns, castings, normalizing and machining. Ask for full scale template drawings in your size range.



Sure Lock Fixture Keys See Page 41 of our Template Catalog



WRITE FOR FREE CATALOG

Our complete line of highest quality jig and fixture parts is shown in our new catalog. They are stocked for quick delivery from Dealers coast-to-coast. Write for your copy today!

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MANUFACTURERS OF GENUINE NOBLE & STANTON PARTS

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We are especially qualified to meet your automation parts requirements. Our prices, quality and delivery will more than please you. Send your prints for prompt quotations.

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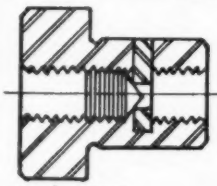
Just a Few of the Many

NEW ITEMS

in our Line of 500 Components



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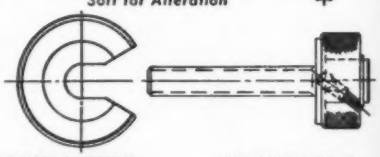
DOUBLE CAM LEVERS

FLAT NOSE HEEL CLAMPS

Soft for Alteration



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4	25	46	66	123	145	180	593	1621	1704	1824	1952	2032	2113	2183
5	26	47	67	124	147	183	1521	1622	1705	1851	1953	2033	2114	2184
6	27	48	68	125	148	184	1522	1623	1721	1852	1954	2034	2131	2185
7	28	49	69	126	149	187	1523	1651	1722	1853	1955	2041	2132	2186
8	29	50	70	127	151	188	1541	1652	1723	1854	1956	2042	2133	2187
9	30	51	72	128	153	189	1542	1653	1771	1861	1957	2043	2134	2191
10	31	52	105	129	155	190	1571	1661	1772	1862	1961	2044	2151	2192
11	32	53	107	130	186	193	1572	1662	1773	1863	1962	2051	2152	2193
13	33	54	108	131	189	194	1573	1663	1781	1864	1963	2052	2153	2194
14	34	55	109	132	160	197	1581	1691	1782	1865	1991	2061	2154	2211
15	35	56	111	133	163	198	1582	1692	1783	1911	1992	2062	2161	2212
17	36	57	112	134	164	201	1583	1693	1811	1912	1993	2063	2162	2231
18	37	60	113	135	167	207	1584	1694	1812	1913	2001	2091	2171	2232
19	41	61	115	140	168	208	1585	1695	1813	1921	2002	2092	2172	2233
21	42	62	116	141	171	225	1611	1696	1814	1922	2003	2093	2173	
22	43	63	117	142	173	226	1612	1701	1821	1923	2021	2094	2174	

EDITORIAL ITEMS

A1	A19	A37	A57	B5	B23	B41	B59	C1
A2	A20	A38	A58	B6	B24	B42	B60	C2
A3	A21	A39	A59	B7	B25	B43	B61	C3
A4	A22	A40	A60	B8	B26	B44	B62	C4
A5	A23	A41	A61	B9	B27	B45	B63	C5
A6	A24	A42	A62	B10	B28	B46	B64	C6
A7	A25	A43	A63	B11	B29	B47	B65	F1
A8	A26	A44	A64	B12	B30	B48	B66	F2
A9	A27	A45	A65	B13	B31	B49	B67	F3
A10	A28	A46	A66	B14	B32	B50	B68	F4
A11	A29	A47	A67	B15	B33	B51	B69	F5
A12	A30	A50	A68	B16	B34	B52	B70	F6
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A18	A36	A56	B4	B22	B40	B58	B76	

Which article in this issue was of most interest to you? _____

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THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

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21	42	62	116	141	171	225	1611	1696	1814	1922	2003	2093	2173	
22	43	63	117	142	173	226	1612	1701	1821	1923	2021	2094	2174	

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A5	A23	A41	A61	B9	B27	B45	B63	C5
A6	A24	A42	A62	B10	B28	B46	B64	C6
A7	A25	A43	A63	B11	B29	B47	B65	F1
A8	A26	A44	A64	B12	B30	B48	B66	F2
A9	A27	A45	A65	B13	B31	B49	B67	F3
A10	A28	A46	A66	B14	B32	B50	B68	F4
A11	A29	A47	A67	B15	B33	B51	B69	F5
A12	A30	A50	A68	B16	B34	B52	B70	F6
A13	A31	A51	A69	B17	B35	B53	B71	F7
A14	A32	A52	A70	B18	B36	B54	B72	F8
A15	A33	A53	B1	B19	B37	B55	B73	F9
A16	A34	A54	B2	B20	B38	B56	B74	F10
A17	A35	A55	B3	B21	B39	B57	B75	
A18	A36	A56	B4	B22	B40	B58	B76	

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We say "production men only" because this is a *work* book, not a picture book. It's a case-bound volume of 196 pages, packed full of technical data on the analyses, uses, handling and shop treatment of all grades of A-L Tool and Die Steels. Sent free, but ask for it on your company letterhead, please.

Address Dept. TP-90

"What's *that* piece?" . . . "Are you *sure?*" . . . In anybody's toolroom or stock racks, the best inventory or material identification system is apt to go haywire once in a while—and sometimes with grievous results.

But not when you're using tool steel grades produced by Allegheny Ludlum! Each length of AL Tool Steel is clearly marked with its grade name every few inches the entire length of the bar—*stenciled* in such a manner that the marking stays bright and clear, and can't be blurred or erased in handling.

Even a small crop end on a machine bench is readily identifiable—you can't go wrong. And that's only a small part of the benefit you can realize by using AL Tool Steels—available from stocks coast to coast. Let our Metallurgical Service go to bat on some of your tougher tool steel problems. ***Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.***

For nearest representative, consult Yellow Section of your telephone book.

For complete MODERN Tooling, call

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WSW 5321A

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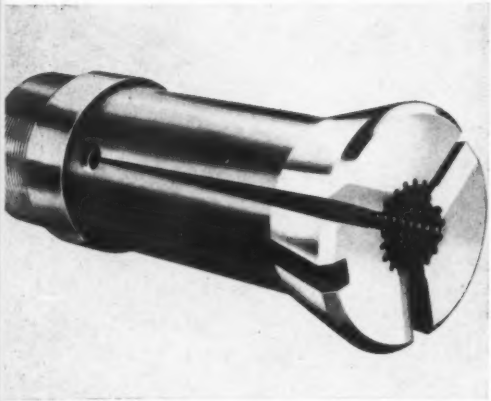
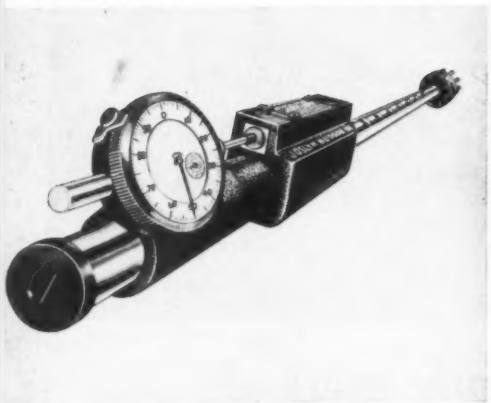
PRODUCTS

NEW DEVELOPMENTS · IMPROVEMENTS · COST AND TIME SAVERS



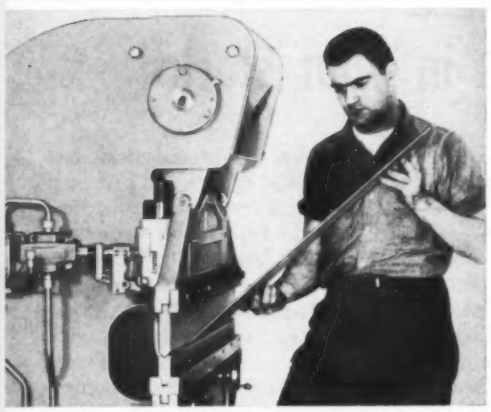
COLLET . . .

The S-C collet has angular ground surfaces at the end of the collet slits that repel sludge and chips and prevent foreign matter from entering the collet and mechanism of the machine. Rings and felts are eliminated. Sheffer Collet Co., Traverse City, Mich., or — **Circle No. A1.**



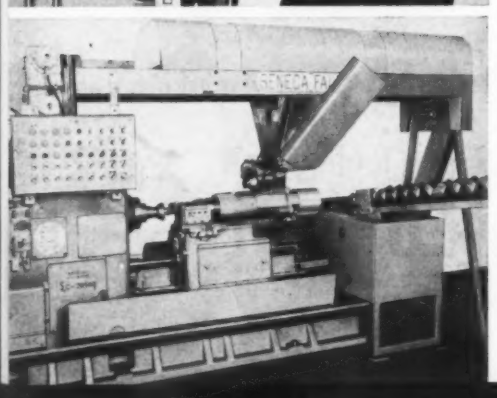
TRAVEL CONTROL . . .

The Acra-Stop, a micrometric travel control for engine and turret lathes, provides accurate production control of repeat machine operations. It increases production and prevents waste. The dial indicator measures accurate cutting to 0.001". Joslyn-Hudson Corp., Dept. 53, 2040 Colorado Ave., Santa Monica, Calif., or — **Circle No. A2.**



CONTROL ON PRESS BRAKE . . .

Eliminate whipping and resultant kinking of sheet material during forming operations with a new let-up control on hydraulically operated Di-Acro press brakes. Basic element is an adjustable flow control valve. O'Neil-Irwin Mfg. Co., 626 - 8th Ave., Lake City, Minn., or — **Circle No. A3.**

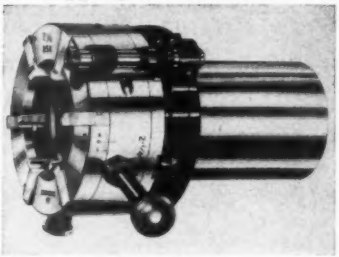


AUTOMATIC LOADER . .

Model VHM automatic loader and transfer mechanism can be installed on new or existing lathes, grinders or other machines that operate on an automatic cycle. It can be used with any machine that can be loaded from above. Seneca Falls Machine Co., Seneca Falls, N. Y., or — **Circle No. A4.**

DIE HEAD . . .

This 2¼" DSA convertible die head is designed for the No. 4 Brown & Sharpe automatic. It is equipped with both an outside trip for short length, fine pitch shoulder threading, and a pull-off trip for longer threads providing ample chaser engagement for tripping. Conversion from



one trip to the other is quick and simple. The shank shown is to maximum size and is altered to 1¾" dia when used on the Brown & Sharpe No. 4. The aligning shank feature is standard on all DSA die heads. Geometric Tool Co. Div'n, Greenfield Tap and Die Corp., New Haven 15, Conn., will supply further information, plus complete specifications, or— **Circle Inform-A-Gram No. A5.**

SURFACE GRINDER . . .

A low-priced 6 x 18 capacity surface grinder has been announced by Boyar-Schultz Corp., 2000 S. 25th Ave., Chicago, Broadview, Ill. The Challenger

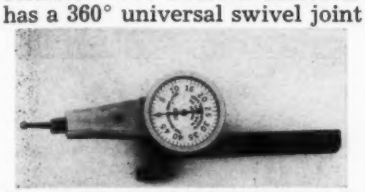
is guaranteed within 0.0002" for flatness and accuracy. For complete details on this new surface grinder, contact the company, or **Circle Inform-A-Gram No. A6.**

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

DIAL INDICATOR . . .

The contact point of this dial indicator has an automatically reversible up-or-down action, and no reversing lever or gear shift to stick or break. The point is longer than usual and more accessible. The Pearson indicator has a 360° universal swivel joint



for positive support in any position convenient to the work. Range is 0.075″. The indicator is used for aligning holes on a jig borer or boring mill and truing, inspection, straightening, and general setup to within tenths of a thousand. (Mfg'd by M. & G. Instrument Co., N. Hollywood, Calif.) Quality Control Corp., 401 Broadway, New York 13, or **Circle Inform-A-Gram No. A7.**

POSITIONING TABLE . . .

This large size universal positioning table is to be used with the Howe & Fant turret drilling and tapping machine, but can be used on single spindle drill presses and radial drills, reproducing any pattern of holes within a 10½″ x 12″ rectangle. The

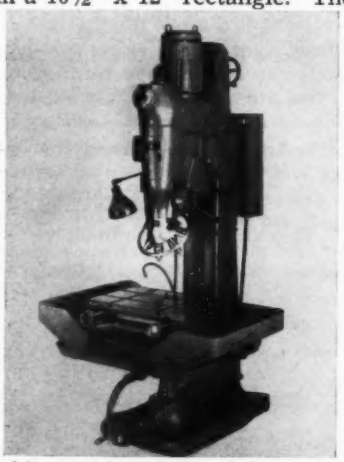
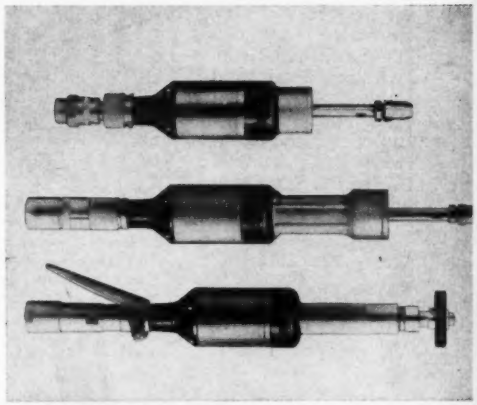


table can be changed from one job to another by substituting a new hole location plate. It will consistently repeat its position within 0.001″ total variation. Howe & Fant, Inc., E. Norwalk, Conn., or — **Circle No. A8.**

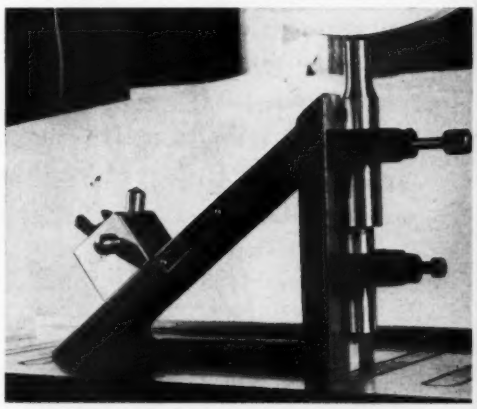
AIR GRINDERS . . .

A new line of small air grinders has been announced by The Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 32. M1170 Series provides 50% more power. There are 45 basic models and 20 different arbors and collets. Shown are the short, long, and small end types featuring simplified construction for easier maintenance.
Circle No. A9.



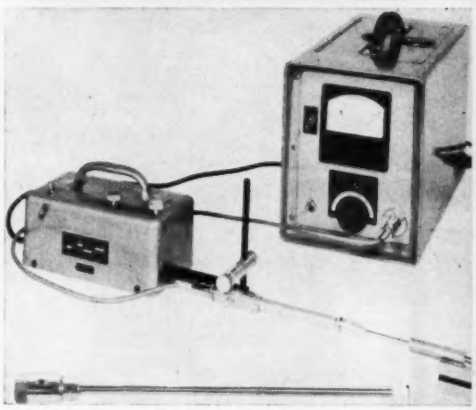
WHEEL AND PUNCH DRESSER . . .

This combination punch and wheel dresser eliminates V-blocks and other holding fixtures to grind pins and punches up to ¾″ dia. The punch grinder is a built-in part of the device. Haverlock Machine Co., 151 Dover St., Boston 18, or —
Circle No. A10.



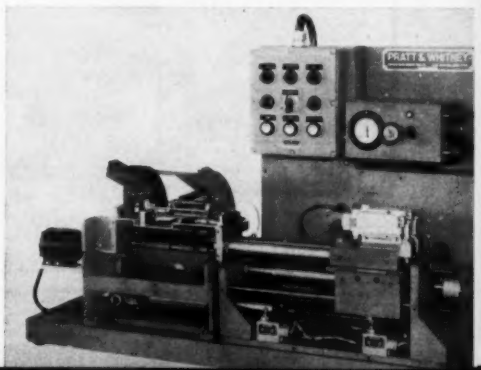
TRACER . . .

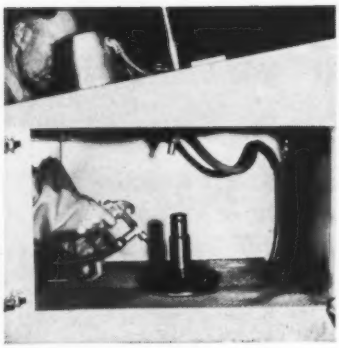
Designed for surface roughness measurements in ¼″ dia holes to a depth of 6″ is Profilometer Type LC tracer. This standard length tracer is also available in longer or shorter lengths. Details are found in Bulletin LT131 from Micrometrical Mfg. Co., 345 S. Main St., Ann Arbor, Mich., or —
Circle No. A11.



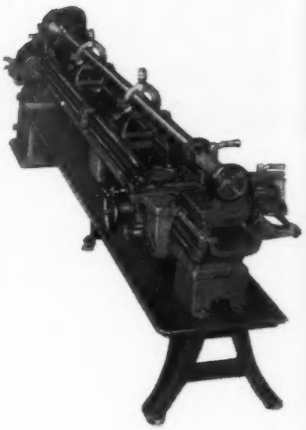
AUTOMATIC GAGE . . .

Check wall and bottom thickness of impact-extruded aluminum tubes with an automatic gaging machine. The automatic tube thickness gaging machine separates tubes into three categories at the rate of 1,000 units/hr. Pratt & Whitney Co., Inc., W. Hartford 1, Conn., or — **Circle A12.**

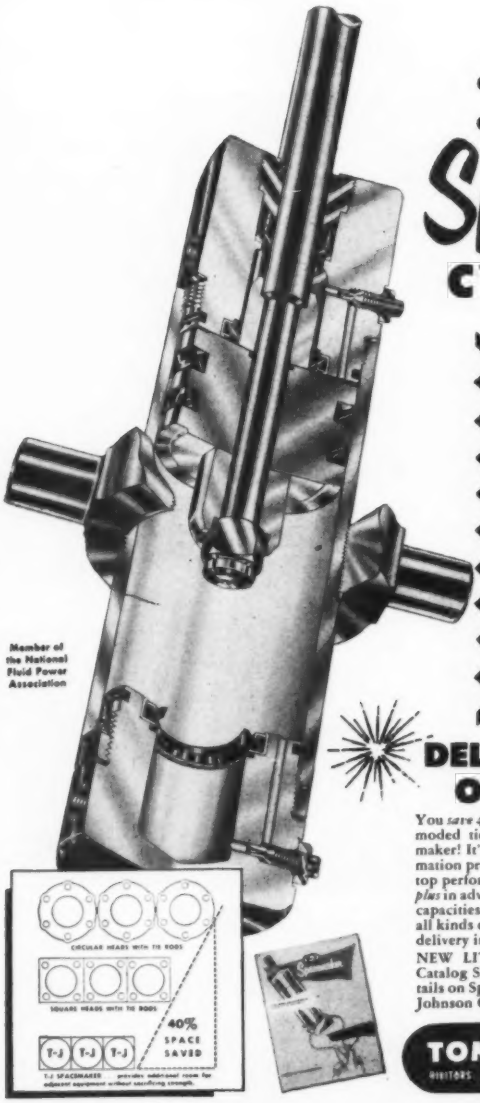




This Sandblast Cabinet can be used either with its adjustable mounted blast unit or with a trigger-controlled hand blast gun (shown). The mounted unit can be moved out of the way when the hand gun, which is optional equipment, is used. Cyclone Sandblast Equipment, 42 Clara St., San Francisco, or — **Circle Inform-A-Gram No. A13.**



Designed for Machining Tubing, shafting, and other long work is a 16" x 14' lathe, which takes up to 129" between centers. With 16 speed drive, the spindle speeds range from 15 to 980 rpm. Spindle hole takes work up to 1⅜". South Bend Lathe Works, South Bend 22, Ind., or — **Circle No. A14.**



all the **EXTRAS** are standard with

T-J Spacemaker CYLINDERS

- **NEW** *exclusive* ingenious cushion designs . . . Super Cushion Flexible Seals for Air . . . New Self-Aligning Master Cushion for Oil.
- **STRONGER** than outmoded tie rod design, proven through actual tests. No tie rods to stretch.
- **SOLID STEEL HEADS** throughout the full line.
- **COMPACT DESIGN** eliminates tie rods, increasing the strength and reducing mounting space required, providing extra room for adjacent equipment.
- **HARD CHROME PLATED** body bores and piston rods . . . assure you of long trouble-free service. (Standard at no extra cost.)
- **METALLIC ROD SCRAPER,** not just a wiper, actually removes foreign matter from the rod.
- **PILOTED PACKING GLAND** with extra long bearing. Additional strength and support to the piston rod.
- **OIL** pressure to 750 p.s.i. AIR to 200 p.s.i.

Member of the National Fluid Power Association

DELIVERY OFF THE SHELF!

You *save 40% space* when you switch from outmoded tie rod cylinders to the T-J Spacemaker! It's stronger, too! Fits right into automation programs in countless plants. Delivers top performance and dependability with a big *plus* in advanced features. Wide range of styles, capacities . . . reduces man-hours and costs in all kinds of push-pull-lift operations. Off-shelf delivery in 64,000 combinations!

NEW LITERATURE—Send today for new Catalog SM56 with complete engineering details on Spacemaker line. Write The Tomkins-Johnson Co., Jackson, Mich.

T-J

TOMKINS-JOHNSON

VALVES · GAS AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHERS

CIRCLE INFORM-A-GRAM KEY NO. 176

An Improved Interchangeable Die Stamp has been introduced by Sossner Steel Stamps, 161 Grand St., New York 13. In the Time Saver stamp, an insert of specially-hardened steel

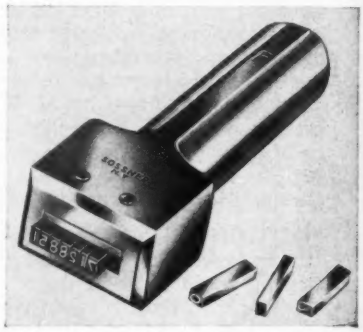
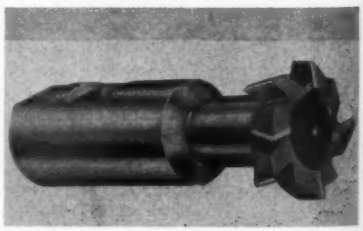


plate is placed under the changeable type to keep the type surface level for a much longer time. The Time Saver stamp is available in three stock sizes featuring a stamp holder for use in hand or press.
Circle Inform-A-Gram No. A15.

A Complete Line of Standard T-Slot Cutters has been added by Quality Tool Works, Waukegan, Ill. The design of the teeth provides ample chip space and the flutes are ground



to give good chip flow and help prevent clogging. The cutters are carried in stock in sizes from ¼" to 1½" bolt size. Carbide tipped T-slot cutters are made to order.
Circle Inform-A-Gram No. A16.

At Buckeye Tools Corp.-

STOCKROOM AREA CUT IN HALF, EFFICIENCY DOUBLED

In redesigning their toolroom to gain additional production space, engineers at Buckeye Tools Corp., Dayton, Ohio, reduced the actual area of the stockroom from 1800 to 900 square feet by using modern Rotabin storage methods for small parts. Each 34"-diameter Rotabin unit holds stock once requiring nine lineal feet of conventional shelving.

A Buckeye engineer comments: "Because of their 12-foot height, the old bins required much climbing in narrow aisles. Now all stock is within easy reach without climbing. Where two men were formerly required to handle the stock, one man is now able to do the job. The production department has put to good use the space gained by this change-over."

Find out, without obligation, how Frick-Gallagher can help you put *more* into *less space*. Write...

The Frick-Gallagher Mfg. Co.
106 So. Michigan Ave.
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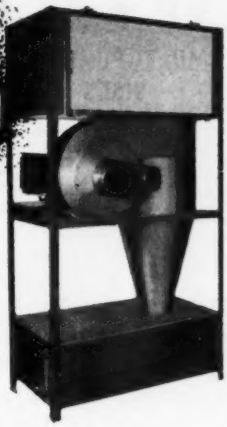
FGM

Technique and Know-How CAN HELP YOU

CIRCLE INFORM-A-GRAM KEY NO. 1771

EFFICIENT—LOW COST Dust Collection



Easy installation . . . efficient low-cost operation . . . simplified maintenance, make Dustkop *FIRST* among equipment to collect most all industrial dusts. There are Dustkop models to eliminate your dust problems . . . that are space saving, self-contained units, or exhaust type for rafter, ceiling or outside location. Write for descriptive literature.

DUSTKOP® STOPS DUST

37 STANDARD MODELS TO CHOOSE FROM
• READY TO USE

Also a Complete Line of Mist Collectors

AGET MANUFACTURING COMPANY
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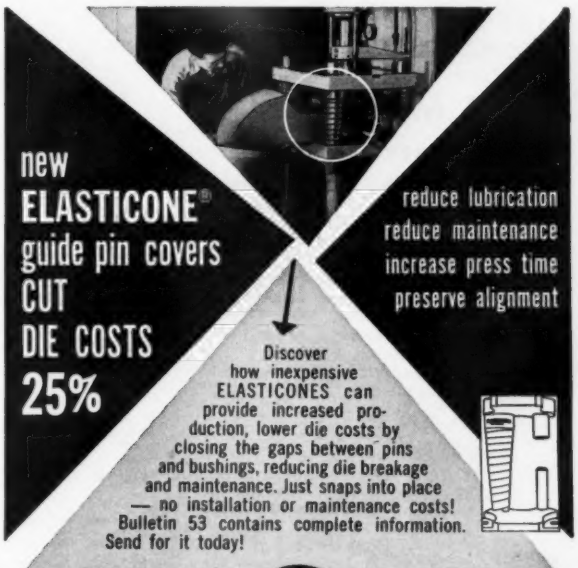
CIRCLE INFORM-A-GRAM KEY NO. 1772


new
ELASTICONE®
guide pin covers
CUT
DIE COSTS
25%
reduce lubrication
reduce maintenance
increase press time
preserve alignment
Discover how inexpensive ELASTICONES can provide increased production, lower die costs by closing the gaps between pins and bushings, reducing die breakage and maintenance. Just snaps into place — no installation or maintenance costs! Bulletin 53 contains complete information. Send for it today!

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TP-6

CIRCLE INFORM-A-GRAM KEY NO. 1773

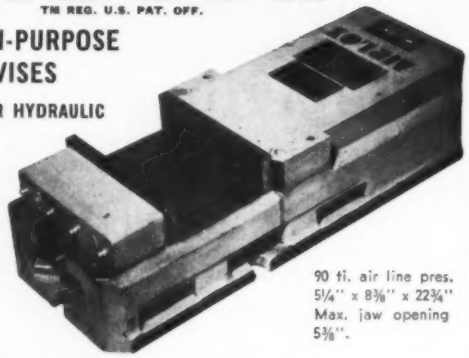
FOR PRECISION PRODUCTION

AIRLOX

TM REG. U.S. PAT. OFF.

MULTI-PURPOSE VISES

AIR OR HYDRAULIC



Type S-7 Illustrated

90 ft. air line pres. 5¼" x 8⅜" x 22¾" Max. jaw opening 5⅜".

ADAPTABLE AS POWER JIG OR FIXTURE OR SHORT STROKE BENCH PRESS

AIRLOX vises are precision built tools powered by specially engineered air or hydraulic cylinders. They can be operated manually or synchronized with the movement of a milling machine table or drill press spindle. They can be furnished in sets if desired so that the same tolerance is held between the base cross keyway and fixed jaw casting face on each vise.

AIRLOX patented wedge-&-lever action utilizes total cylinder drive, providing positive rigid grip on the work, exceptionally suited to carbide milling and almost all other milling operations.

Write for descriptive literature

production devices incorporated

Whitehall, N. Y. - - phone 40

CIRCLE INFORM-A-GRAM KEY NO. 1781

NUMBERALL

CUTS THE COST OF STAMPING NUMBERS

NEW MODEL 70

MULTI-WHEEL NUMBERING MACHINE

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Model 70 NUMBERALL machines are used in all industries to mark various parts. Stamps numbers, etc., quickly . . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20. Can be furnished in 1/32" to 3/8" high figures, sharp face gothic or shaded roman style. Write for Bulletin TP-70.

Hand shank Model 70 illustrated. Press shank for foot or power presses also available.

Model 50 Automatic Numbering Head (at left). Write for Bulletin TP-70.

We also make other numbering heads, non-automatic, with quick-set wheels. Write for catalogs TP-80 and TP-85.

NUMBERALL STAMP & TOOL CO.

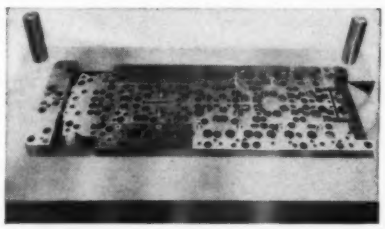
HUGUENOT PARK STATEN ISLAND 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1782

Holes

JIG GROUND with *Vulcanaire*

Provide yourself with this inexpensive* instrument for use on your present equipment and JIG GRIND with a guarantee.



41ST year of Vulcan service.

A seven station die from Vulcan's contract Tool Room. Standard sized punches and buttons were used. But since forming and piercing operations were involved hardening of the sections was necessary followed by JIG GRINDING. Result: Close tolerances held easily and perfect progression throughout — another satisfied customer.

Borrow our instructive 11 minute movie on Jig Grinding.

A five station indexing fixture from Vulcan's contract Tool Room. Using a jig borer index table with the Vulcanaire 5 indexing holes and 35 locating and clamping holes were JIG GROUND in place. Result — eliminated all close locating and dowelling of individual parts, and of course hours of time.

*Vulcanaire equipment pays for itself on the first job.

Services of YOUR TOOL ROOM in Dayton

Engineering, Processing, Designing . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and Size . . . Vulcanaire Grinding Heads . . . Motorized Rotary Tables . . . Plastic Tooling . . . Vulcanaire Jig Grinders.

VULCAN TOOL CO.

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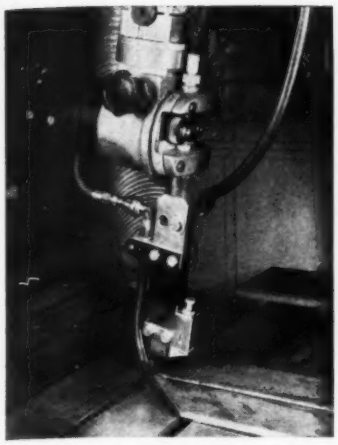
CIRCLE INFORM-A-GRAM KEY NO. 1783

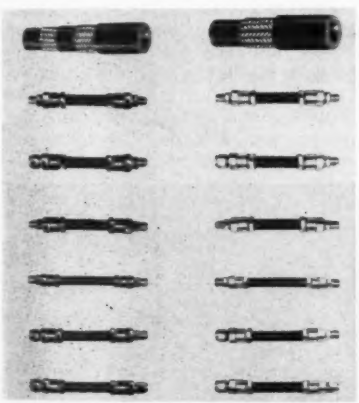


This Dry-Type Torch is used for automatic Fillerarc welding in a carbon dioxide atmosphere. It is rated for operation up to 800 amps. Hose connections, which are necessary for operation of water-cooled torches, are eliminated. General Electric Co., Schenectady 5, N. Y., or —
Circle No. A17.

Increase Output of Aluminum, Brass, and Steel Parts on Bridgeport type vertical milling machines with a new line of shank type carbide face mills. They are offered in 14 standard models with 1½", 2", and 2½" dia cutters with integral ¾" straight shanks and overall length of 2⅞". Complete information is found in Bulletin FM-27 from Bollier-Damerell, Inc., Niagara Cutter Div'n, 330 Niagara St., N. Tonawanda, N. Y., or —
Circle No. A20.

A Miniaturized Series of self-locking wire thread inserts has been introduced by Heli-Coil Corp., Danbury, Conn. The 4-40 Screw-Lock Series is designed to reduce the space and weight limitations of handling fastener problems on electronic, automotive, aviation, machine tool, and instrument assemblies. The easily installed thread inserts eliminate lock washers, lock nuts, and locking wires with an integral gripping coil. They are dimensionally stable over a wide temperature range and resist wear, corrosion, galling, and seizing.
Circle Inform-A-Gram No. A18.

A Complete Line of Medium-High and High Pressure Hydraulic Hose and Hose Couplings has been introduced by Stewart-Warner Corp., Alemite Div'n, 1826 Diversey Pkwy., Chicago 14. These coupings feature double-wedge grip, eliminating the need for skiving rubber covered wire braid hose. They can be reused many times. The hose has an operating temperature range of −40°F to +275°F, and a burst range of from 1,400 to 18,000 lbs/sq in.
Circle Inform-A-Gram No. A19.



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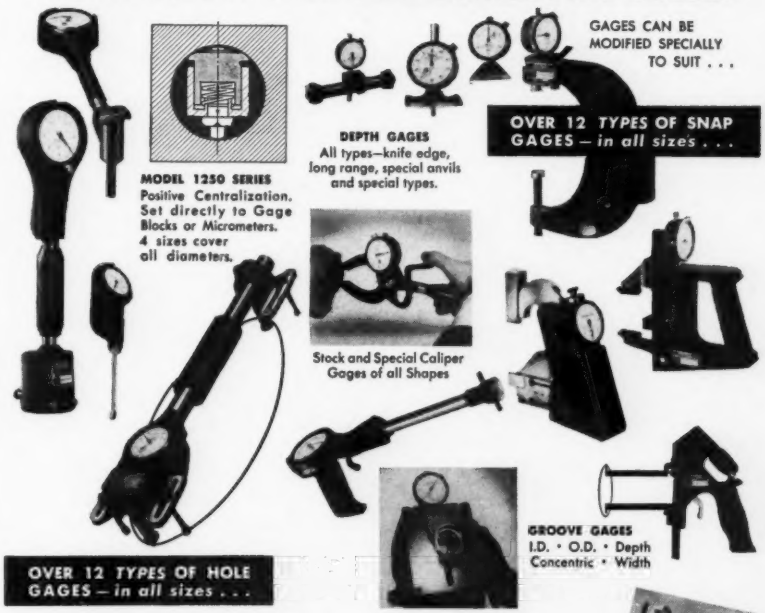
GAGES CAN BE MODIFIED SPECIALLY TO SUIT . . .
OVER 12 TYPES OF SNAP GAGES — in all sizes . . .
DEPTH GAGES
All types—knife edge, long range, special anvils and special types.
MODEL 1250 SERIES
Positive Centralization. Set directly to Gage Blocks or Micrometers. 4 sizes cover all diameters.
Stock and Special Caliper Gages of all Shapes
GROOVE GAGES
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OVER 12 TYPES OF HOLE GAGES — in all sizes . . .

If you are not kidding yourself about Precision you know you have to gage a dimension a certain way if you want an accurate measurement.

That's why good gage users know that just *any* gage is *not* good enough. And that is why Federal makes so many different types of gages of the same general kind.

There are all degrees of accuracy required and Federal takes the care to obtain that accuracy.

And some need more gaging pressure, and some less, and some need narrow anvils and some need wide. Some want to gage just a hole diameter and some want to know if it's round or if it tapers.

MANY OTHER TYPES
Send for Catalog. Illustrates the most extensive line available.

It's easy to find the gage you need — get in touch with us. Do it now.

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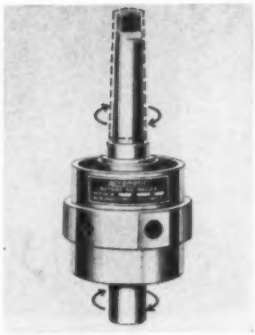
7236 Eddy Street • Providence 1, R. I.

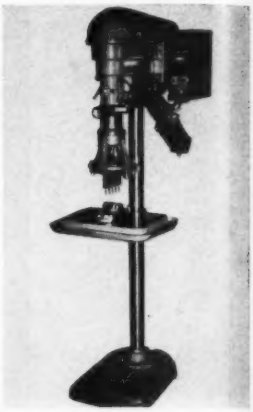
Whatever You Need in Gages —
Ask **FEDERAL** *First*

CIRCLE INFORM-A-GRAM KEY NO. 179

Eliminate Friction and Heat Generation in deep hole drilling with a perfected oil inducer. With this oil inducer, gun drills are easily adapted to all types of equipment for drilling and boring operations. It is also available for all types of oil hole drills. Acromatic Tool Co., 21150 Coolidge Rd., Oak Park, Mich., or —
Circle No. A21.

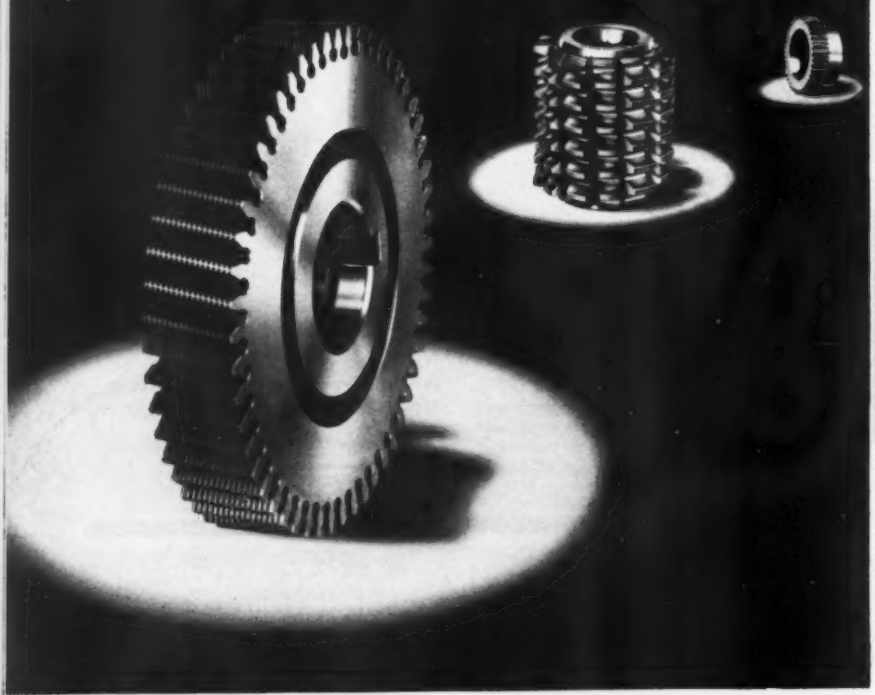


Single and Multiple Spindle Operations are performed by a new low-cost combination tapping-drilling machine. The Renco-Air machine is switch controlled to alternate between tap and drill positions for either right or left hand operation. It is reported to increase production, cut setup costs, and reduce the number of fixtures required. Renco-Toledo, Inc., 3358 W. Alexis Rd., Toledo 13, or —
Circle No. A22.

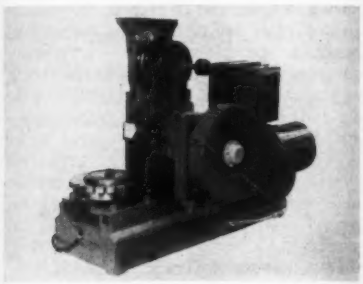


the Finest Tools
come from
GEAR PRODUCTION
HEADQUARTERS

MICHIGAN TOOL Company
from blank to finished gear
7171 E. McNICHOLS RD. · DETROIT 12, MICHIGAN, U.S.A.



Riveting in Deep Channel Sections and hard-to-reach areas is performed by this pedestal-type machine with extra long stroke. Model FM is available with quick change raceways that can be applied to feed rivets of various diameters and



shapes. Having a throat depth of 9½", Model FM can handle steel tubular rivets ⅛" dia by ⅛" long through $\frac{3}{16}$" dia by 1" long. The Milford Rivet & Machine Co., Milford, Conn., or —
Circle Inform-A-Gram No. A23.

Facilitate Drilling Holes to Close Limits in flats, profiled shapes, and angles, and eliminate an individual jig with the Jable adjustable drilling jig system. Up to nine holes can be drilled at one setting. Although the system was intended for short run production, rigidly fixed plate attach-

ments can be incorporated to handle longer runs. The Jable can be converted into a light milling or tapping fixture by stripping the arms and leaving the two top clamps in suitable positions. Douglas Export-Import Corp., 17 Battery Pl., New York 4, or —
Circle Inform-A-Gram No. A24.

TAP WITH TAPMATIC

2

COMPLETE LINES FOR EITHER REVERSIBLE OR NON-REVERSIBLE SPINDLES

COMPLETE RANGE OF SIZES UP TO 2" TAP CAPACITY

CUT COSTS

INCREASE PRODUCTION

OBTAIN GREATER PRECISION

WEIGHTLESS FLOATING ACTION

Only Tapmatic offers this "weightless tapping" feature . . . customary human lead error is eliminated . . . consistently uniform threads are assured.

POSITIVE TORQUE CONTROL

Tapmatic's exclusive positive torque adjustment clutch stops tap instantly when tap becomes dull, loaded or bottoms in blind hole . . . operator sensitivity no longer a factor.

Literature Upon Request

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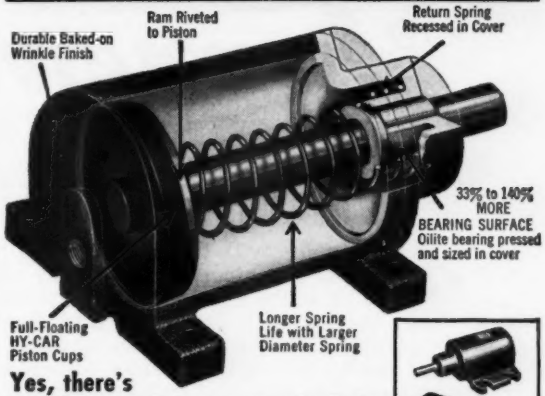
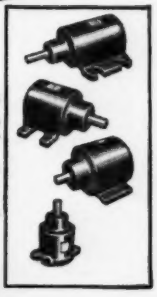
CIRCLE INFORM-A-GRAM KEY NO. 1811

SINGLE-ACTING CYLINDERS
COST LESS: to buy, to use!


Durable Baked-on Wrinkle Finish
Ram Riveted to Piston
Return Spring Recessed in Cover
33⅓% to 140% MORE BEARING SURFACE
Oilite bearing pressed and sized in cover
Full-Floating HY-CAR Piston Cups
Longer Spring Life with Larger Diameter Spring

Yes, there's no doubt that simple, spring-return air cylinders are cheaper to start with, and use only half as much air as double-acting cylinders. The valves and hookups are simpler and cheaper, too.

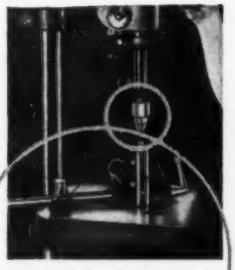
What's more, MEAD distributors carry local stocks for *immediate* delivery in six bores from 1" to 6", six stroke lengths from ½" to 3", and three mountings. Write now for single-acting cylinder catalog HA-67.



MEAD

SPECIALTIES CO., 4114 N. Knox, Dept. HA-67, Chicago 41, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1813



AMAZING TWIN TOOLS

•

INCREASE DRILL PRESS PRODUCTION

AMF Wahlstrom Automatic Keyless Chuck: Convert 95% of lost tool-changing time to productive time. A single chuck does the work of several spindles. The greater the load, the tighter the grip. No stopping of the spindle to change tools.

AMF Float-Lock Instant Change Vise: Positive anchoring on drill press table. *Floats and Locks* in any position. Holds work safely for accurate drilling and tapping.

Write for details and name of nearest distributor.

AMF Tool Division
AMERICAN MACHINE & FOUNDRY COMPANY
224 Glenwood Avenue, Bloomfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1812

Find out how . . .

Sperry

Hydraulic REMOTE CONTROLS

give you instant, positive . . .

- circular motion
- straight line motion
- multiple control
- geared take-off

accurate manual or automatic control

TP-6

SPERRY PRODUCTS, INC.
1103 Shelter Rock Road
Danbury, Connecticut

☐ Send complete hydraulic control information
☐ Have technical representative call

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 1814

FRICTION SAWING with Tannewitz

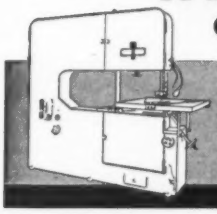
HIGH SPEED BAND SAWS

FASTEST, BEST MEANS OF CUTTING METALS

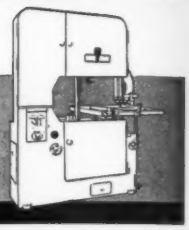
If you are not familiar with the advantages of friction sawing with these machines, by all means drop us a line asking for "Friction Sawing Data." You can save many times the cost of a Tannewitz High Speed Band Saw and greatly expedite production by using it to cut sheets of both hard and soft steel, formed or flat, trimming malleable and steel castings, cutting armor plate or many other materials. Write NOW!

THE **TANNEWITZ WORKS**

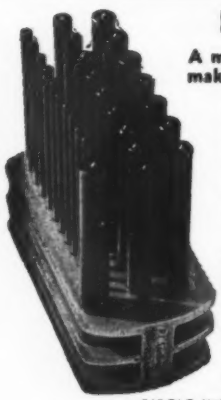
GRAND RAPIDS, MICHIGAN ☎ GL-6-1729



TANNEWITZ DI-SAWS — 24", 36", 48", 60" CAPACITIES
for CONTOUR SAWING, FILING, POLISHING
The smoothest, fastest, most trouble-free Di-Saws on the market. Write for bulletin.



CIRCLE INFORM-A-GRAM KEY NO. 1821



SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

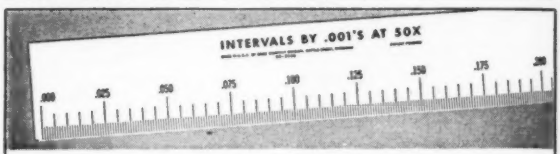
Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand—Sizes 3/32" to ½" by 1/64" plus handy 17/32" size—length 4⅞". PRICE only $17.90

Single size available.

R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1822



Gage Company **PRECISION PLASTIC**

COMPARATOR SCALES

Non-breakable...accurate...designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

An unexcelled tool for use in drafting and constructing scale layouts for comparator chart use. All standard magnifications and various styles for every application.

WRITE FOR BULLETIN NO. 54-1511

GAGE COMPANY

BATTLE CREEK, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1824

Expanding Mandrels

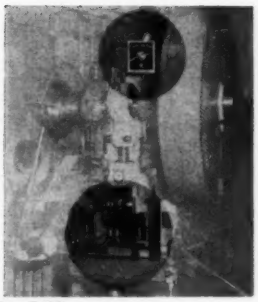
Accuracy .001" - No Distortion

No Slipping - Everlasting

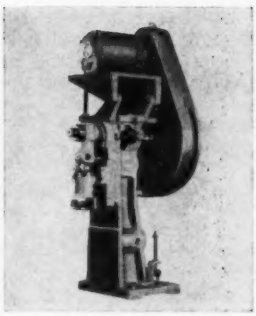
K.O.LEE CO.
ABERDEEN, SOUTH DAKOTA

If it's made by **Lee** *it's a* **"Knock-Out"**

CIRCLE INFORM-A-GRAM KEY NO. 1823



Designed for Use on Automatic Equipment such as presses and molding machines equipped with a solenoid or clutch-type release is a low-cost electronic-mechanical press control. Circuit Master Mark II senses the slightest mechanical overload from almost any malfunction. It is self-adjusting and wear-compensating. Wintriss, Inc., 20 Vandam St., New York 13, or — **Circle Inform-A-Gram No. A25.**

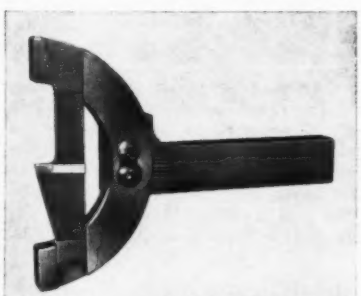


This Adjustable Bed and Horn Press has been developed for the electronic, electrical, and light metalworking industries by E. W. Bliss Co., Canton 10. Model 08H has a capacity of 4 tons. It is equipped with a rolling key clutch that can be arranged for single or continuous operation. This bench press is useful on comparatively small work, permitting high speeds with and without automatic feeds and devices. **Circle Inform-A-Gram No. A28.**

Construct Work Stations, storage areas, and workbenches from standard components to fit individual needs with the new module bench and storage system. Component parts include standard shelf units, three

sizes of hopper from pans, and several models of benchtop bin storage units. The unit features readily accessible parts storage. Bathey Mfg. Co., Plymouth, Mich., or —
Circle Inform-A-Gram No. A26.

A New Cut-Off Tool with Carbide-Tipped Blades is now being produced by Criterion Machine Works, 765 W. 16th St., Costa Mesa, Calif. The blades can be purchased separately and used with all standard holders now in use. The cutting widths are 0.060" in sizes that will part 1½"



stock and 0.090" in sizes to handle 3" and 4" dia. The company has also announced a heavy duty model of the 4" dia capacity tool for parting or grooving hard-to-machine materials and a larger tool capable of parting stock to 6" dia.
Circle Inform-A-Gram No. A27.

Let us help you select the press that's *"right"* for your needs . . .

PERKINS PRESSES OPEN BACK INCLINABLE

FROM **5** TO **135** TONS

WITH NEW FEATURES FOR IMPROVED PERFORMANCE

Save Time, Money, Guesswork — send for full information on Perkins O.B.I. Presses. There's an O.B.I. Press that's *"right"* for your job. Clip Coupon and Mail **TODAY!**

PERKINS MACHINE COMPANY

20 PERKINS STREET WARREN, MASS., U. S. A.

Please send complete information and specifications on the O.B.I. to:

NAME _____

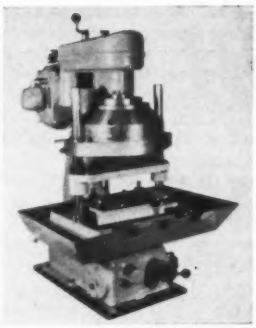
COMPANY _____

ADDRESS _____

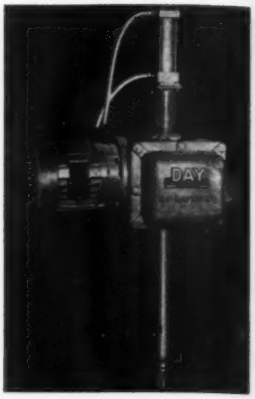
CITY _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 183

The Zagar Gearless Drill Head has been applied to a separate line of small drill presses, that can be equipped with small diameter, medium duty drill heads. The table which holds the part to be drilled, moves upward into the rotating drills. Table travel, feed into drills, and return travel downward are automatic cycling. Zagar, Inc., 23894 Lakeland Blvd., Cleveland 23, or —
Circle No. A29.



Drilling, Boring, Tapping, counterboring, step drilling, and other applications requiring high torque automation are handled by a new line of heavy-duty, self-contained units. The Robotorq package unit has a long stroke from 6" up. Built-in torque limit protects machine and work. For details, see Bulletin DR-457 made available by The George L. Day Co., 1227-31 Niagara St., Buffalo 13, or —
Circle No. A30.



ARMSTRONG
WRENCHES

Types and Sizes for Every Industrial Use

ARMSTRONG Wrenches have engineered designs, a wide safety factor of extra strength, accurately machined openings that go over screw heads or nuts easily, grip firmly—will not slip, round corners or mar faces.

Drop forged from special high tensile carbon and alloy steels, heat treated to an exactly predetermined balance of hardness, toughness and tensile strength. ARMSTRONG Wrenches will not "chew out," will stand up through years of service, making work faster, easier and safer.

In sizes and types, ARMSTRONG Wrenches comprise the most complete line of industrial wrenches manufactured. Specify "ARMSTRONG" when ordering wrenches.

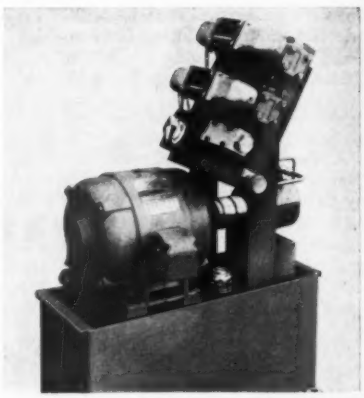
Write for Catalog

ARMSTRONG BROS. TOOL CO.
5220 W. ARMSTRONG AVE. • CHICAGO 30, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 184

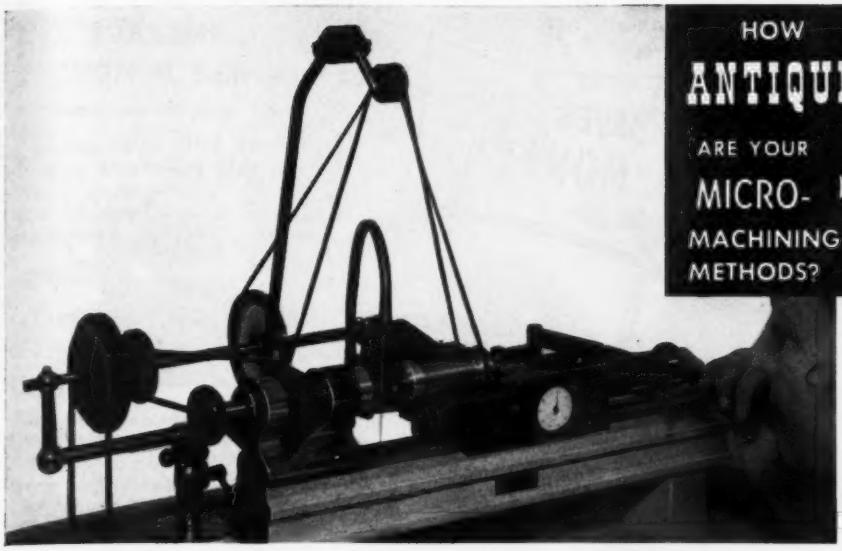
Fourteen Different Mounting Styles to meet a wide range of requirements are a feature of Logan-square cylinders for air or oil service. Cylinder sizes range from 1½" to 8" bores. Cushioning is available for either or both ends, as specified. Operating pressures are 150 psi air service or 300 psi oil service. Logansport Machine Co., Inc., Logansport, Ind., or—**Circle Inform-A-Gram No. A31.**

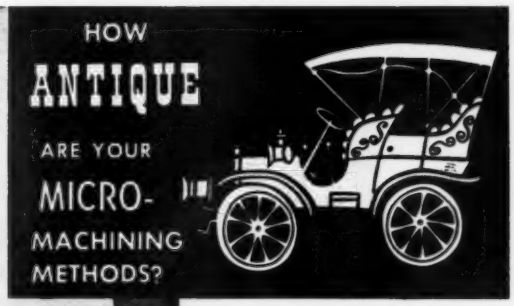
Supply Automatic Feed and Traverse Action in automated machine tool setups with a new power unit. Model ST-10 has a capacity of 5 gpm at 2,000 psi. It has a pressure compensated pump with flow control features. A variable volume control



can be had to allow various maximum volume settings. Model ST-10 can be adapted to feed and traverse jobs such as milling, drilling or pressing operations by using one of two available circuits. The Rosaen Co., 1756 E. 9 Mile Rd., Hazel Park, Mich., or—**Circle Inform-A-Gram No. A32.**

Commercial Water Hardening Drill Rod has been developed by Marshall Steel Co., Box 108TP, Lagrange, Ill. It will heat treat, machine, and perform the same as the company's Aristocrat line of ground flat stock. Sizes range from No. 1 to No. 80 and 1/64" to 2". For further information, contact the company, or —
Circle Inform-A-Gram No. A33.





DRILL MICRO-HOLES

DOWN TO .0016" with SPEED & ACCURACY

ON LEVIN® INSTRUMENT LATHES

The Levin micro-drilling equipment shown here can be used with the smallest drills available. It is designed so that the drilling does not depend on the operator's sense of feel. The drill can be retracted for chip removal and returned to the drilling position without striking the bottom of the hole. While commercial drills can be had as small as .0016" this micro-drilling apparatus has successfully produced holes as small as .0006".

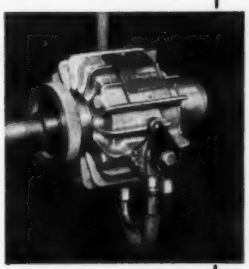
Send for Catalog M describing complete line of instrument lathes and accessories.

LOUIS LEVIN & SON, INC.—3610 S. BROADWAY—LOS ANGELES 7, CALIFORNIA

CIRCLE INFORM-A-GRAM KEY NO. 1851

WILSON AIR COLLET CLOSERS

Increase Production 20% + for most lathes to 1" bar stock cap.



- Hold delicate parts without damage or adjustment.
- Iron grip for heavy work.
- No adjusting for stock or part variations.
- Finger-tip or foot control eliminates operator fatigue.
- Eliminates jarring of head stock.

Write for literature

WILSON AIR COLLET CLOSER, INC.
909-T 40th Ave. N.E. • Minneapolis 21, Minnesota

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HAND KNOBS

6 SIZES
CAST IRON

Tapped, Reamed or Blank.
Hex-shaped hub for extra tightening.

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Dept. HK-2 • Englewood, Ohio

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Illinois Tool Works Functional Gear Checking Instrument with Mechanical Recorder

• Low initial cost • Faster more economical gear checking for in-process quality control • Recorder provides accurate graphic record of results • Easy to use, economical to operate • Write for catalogs AD 37-39

MACHINE AND INSTRUMENT DIVISION
ILLINOIS TOOL WORKS
2501 N. Keeler Ave., Chicago 39, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1854

NEW

Contour Gripping FIXTURE

SAVES YOU MONEY!

CUTS SPECIAL FIXTURE COSTS

INSTANTLY GRIPS AND HOLDS ANY ODD SHAPED PIECE

TAKE BIGGER CUTS

- **FASTER**
- **SAFER**
- **CHEAPER**

THOUSANDS OF USES

This amazing fixture holds any shape in any position . . . for drilling, milling, shaping or grinding. It only has to be set once to take identical pieces for any operation on all types of machine tools.

Investigate its possible application in your business. Write for further details or demonstration.

NO MORE BLOCKING SHIMMING HOLDS ANY SHAPE IN ANY POSITION

WRITE for Further Information Today

Act Now!

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CIRCLE INFORM-A-GRAM KEY NO. 1861

MAKE MONEY---SAVE MONEY

with WARDWELL'S Universal Automatic FLUTE GRINDER

GRINDS TOOLS LIKE THIS FROM SOLID!

Model 90FS

Make your own twist drills, spiral or straight reamers and end mills from solids on a production basis and save money.

Also avoid costly delays when special drills or reamers are required. Make drills as small as 1/16". Indexes automatically. No special skill needed.

Descriptive Bulletin 90FS—Free

WARDWELL MANUFACTURING CO.

3809 Ridge Rd., Cleveland, O.

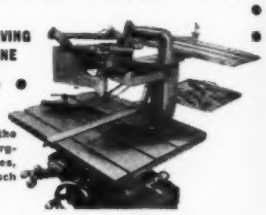
Maker of Largest Line of Saw and Tool Sharpening Machines

CIRCLE INFORM-A-GRAM KEY NO. 1862

How to **ENGRAVE PANELS & SIGNS** *to 30" wide by any length*

Use the LOW COST precision built Preis-Panto 2D-4

ENGRAVING MACHINE



It does the work of larger machines, costing much more!

- Pantograph is graduated with reductions from 1:1 to 100:1 and will reduce to any size to infinity.
- Pantograph and Spindle link joints equipped with precision ball bearings throughout.
- Precision ball bearing cutter spindle.
- Collet capacity from 1/10" to 1/4" and standard taper shank cutters.
- Six spindle speeds—5,000 to 14,000 rpm.
- All feed-screw dials graduated in .001".

TRADE MARK PANTO

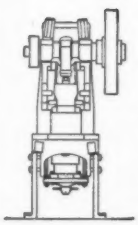
Write for complete details and prices. For immediate attention write directly to manufacturer below. Ask for nearest representative.

H. P. PREIS ENGRAVING MACHINE CO.

647 U.S. Route 22 Hillside, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1863

DIE CUSHIONS



We invite your inquiries, as we have a complete engineering staff to analyze any of your requirements.

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1864

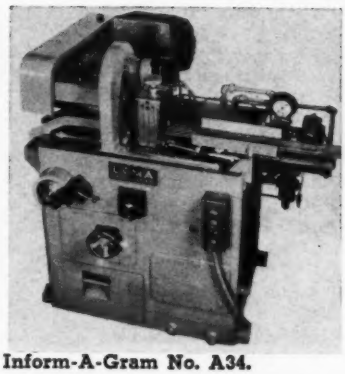
Magnetic Base Indicator holders

Stainless holding rod set in ball socket
Precision adjustment like surface gage
Erick Magna Holder Model 2008 Only $6.50
See your dealer or write for catalogue 755 on the most complete line of magnetic base units & access. mfg'd.
Powerful 80 lb. pull base

CULLEN MFG. CO., RACINE, WIS.

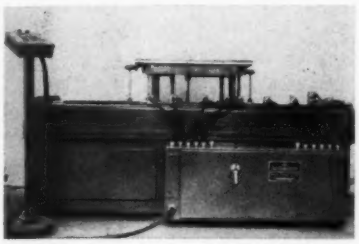
CIRCLE INFORM-A-GRAM KEY NO. 1865

Automatic Cutting-To-Length of non-ferrous tubes and rods is performed by a high-production circular cut-off saw. It can handle sizes ranging from less than ¼" to 4" dia. Shown is the saw arranged for the simultaneous cutting of nine tubes. Loma Machine Mfg. Co., Inc., 114 E. 32nd St., New York 16, or — **Circle Inform-A-Gram No. A34.**



Speedy Layout of Metal in Process and inspection of finished metal parts is possible with the Micro-Height "4" gage. The "4" unit is reported to be a complete tool for almost all checking and measuring operations. With its scriber's straight edge in the down position, it has a 4" direct reading capacity and with the straight edge up, 1" is gained. The Greist Mfg. Co., 485 Blake St., New Haven 15, Conn., or — **Circle Inform-A-Gram No. A37.**

Remove, Transfer, and Load Parts from one work station to another with a new punch press transfer machine. Tooling can also include turnover devices. Although primarily designed to handle work from one punch press to another, the machine



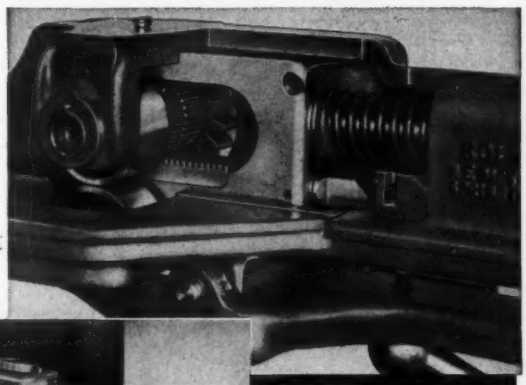
can be tooled for a variety of parts handling operations. Standard model has an adjustable stroke 42" long and 8" high. It features extremely accurate orientation of the workpiece in the loading operation. Automation Development Corp., 135 Reynolds Rd., Mentor, O., or — **Circle Inform-A-Gram No. A35.**

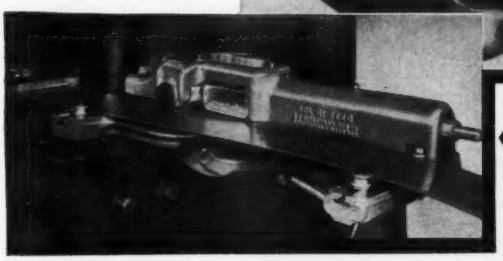
Reduce Machinery Noise and Vibration with a compact, new machine mounting pad from B. F. Goodrich Chemical Co., 3135 Euclid Ave., Cleveland 15. The Air-Loc will reduce noise and absorb vibrations and

shock loads improving machine performance and lengthening machine life. Even after repeated loadings to 1,000 lbs/sq in, the pad recovers 99% of its original thickness. It features an integrated cross-grid embossing, which is an integral part of the pad. **Circle Inform-A-Gram No. A36.**

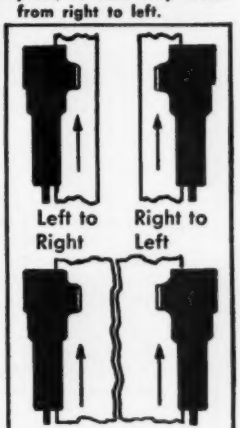
Big Feeds...Big Production...Big Profits...

at SMALL COST!....





Dickerman 12" Rol-Di-Feed, conventionally mounted on the bolster of a punch press, to feed strip stock from right to left.



Here's a new, versatile feed designed to outperform others costing up to 8 times more! The Dickerman 12" Rol-Di-Feed is easily installed on any punch press. This new feed handles with equal ease such different materials as paper, plastic, or cold rolled steel—in thicknesses ranging from .003" to 3/16" in any type of die—piercing, blanking, compound, progressive or draw. The 12" Rol-Di-Feed feeds on the press upstroke and on the downstroke, permitting accurate stock feeds up to 12" per cycle.

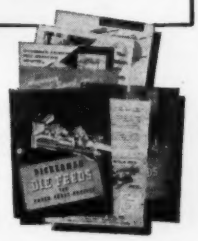
Open side design accommodates stock of almost any width. 12" Rol-Di-Feed can be mounted to feed in any direction . . . or installed in pairs to handle unusual sizes and types of stock. For greater production and profits, eliminate costly "special" feeds—install the new standard Dickerman 12" Rol-Di-Feed on all your press equipment!

Dickerman

H. E. DICKERMAN MFG. CO.

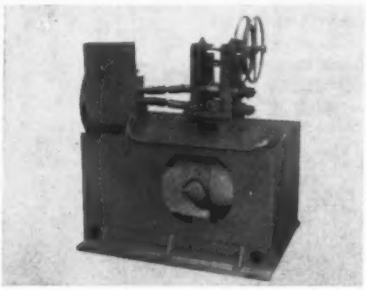
321-306 Albany Street • Springfield, Mass.

Send today for literature on the complete Dickerman line.

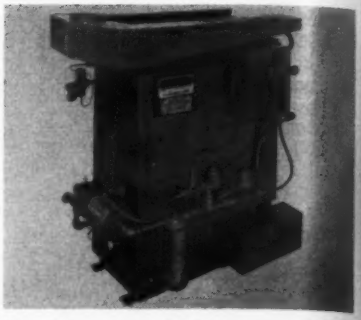


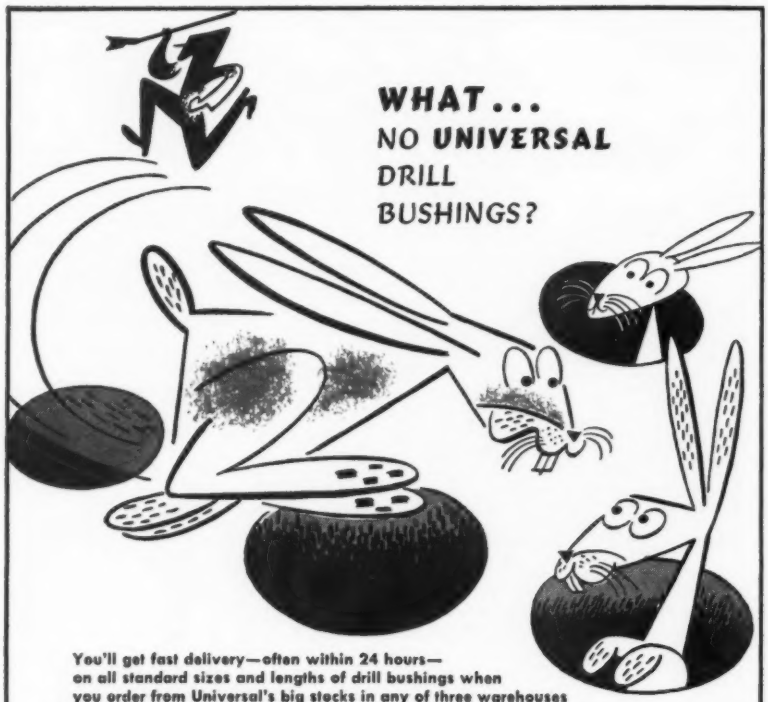
CIRCLE INFORM-A-GRAM KEY NO. 187

Designed for Production Rolling of Special Wire Sections is this wire rolling mill. Model 042 can roll non-ferrous wire at speeds up to 750 fpm with maximum separating force of 40,000 to 60,000 lbs. A full line of accessories is available, including grooved or mirror lapped rolls, work entry guides, edgers and take-up reels. The Fenn Mfg. Co., Newington, Conn., or —
Circle Inform-A-Gram No. A38.



Remove Buffing and Polishing Compounds, honing and abrasive materials, machining chips and non-soluble deposits with a new line of seven standard ultrasonic cleaning machines. The Circosonic machines are used for cleaning blind holes and inaccessible recesses. At an operating frequency of 40 kcy, maximum cleaning or cavitation results with minimum energy input. Circo Equipment Co., 51 Terminal Ave., Clark, N. J., or —
Circle Inform-A-Gram No. A39.





You'll get fast delivery—often within 24 hours—on all standard sizes and lengths of drill bushings when you order from Universal's big stocks in any of three warehouses located at Frankenmuth, Michigan; Kenosha, Wisconsin; and Newark, New Jersey. Even those orders for specially-made, non-standard sizes are filled quickly, thanks to Universal's large-volume production facilities. Machined from highest quality steel, Universal bushings have super-finished bores which lengthen tool life and reduce bushing wear. Wherever there are holes to drill using jigs or fixtures, you'll find that it pays to specify precision-made Universal drill bushings.

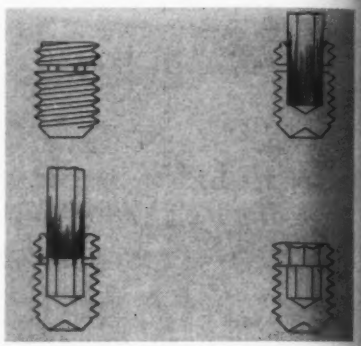
FREE UNIVERSAL SELECTOR. Gives all engineering data for selection of all types and sizes of drill bushings up to 1¾" drill size. Send request on your company letterhead to receive one of these helpful Universal Selectors.

UNIVERSAL ENGINEERING CO., FRANKENMUTH 8, MICHIGAN

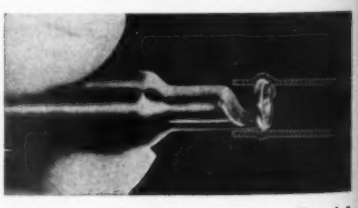
205

CIRCLE INFORM-A-GRAM KEY NO. 188

Designed to Withstand Severe Vibration and Usage is a new self-locking socket set screw which is actually two screws in one. Its construction provides a unique method of wedging screw threads without damage to threads. The set screw is re-usable and can be loosened by wrench and reset in any desired position. The photo shows the screw, inserting the hex wrench to install, locking upper section of screw to bottom and the locked screw. Sta-Loc Inc., 1513 Broadway, Rockford, Ill., or —
Circle Inform-A-Gram No. A40.



Designed for Installation on Flexible Tubing is a new tube fitting that requires no welding, no special adhesives, and no threading. This design assures a joint as strong as the tube itself and does not reduce I.D. or flow. The fitting is especially for plastics and rubber tubing. Special fittings for a wide range of tubing applications are also available. For details, see Data Sheet TF issued by Danielson Mfg. Co., Danielson, Conn., or—**Circle Inform-A-Gram No. A41.**



Hand Finished!

Yes, even in this modern age there are certain jobs that only skilled hands and sensitive human perceptions can do best. Precision thread lapping after grinding is one such job.

Back and forth, back and forth, removing microscopic amounts of metal until the "feel" is right. Then an instrument check, and back to the lap. And so on and on until perfection is attained.

An expensive operation? Yes. But that's why *precision lapped* gages outwear *ground only* gages wherever they are used. When you buy thread gages, always ask, "Are they precision lapped?"

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

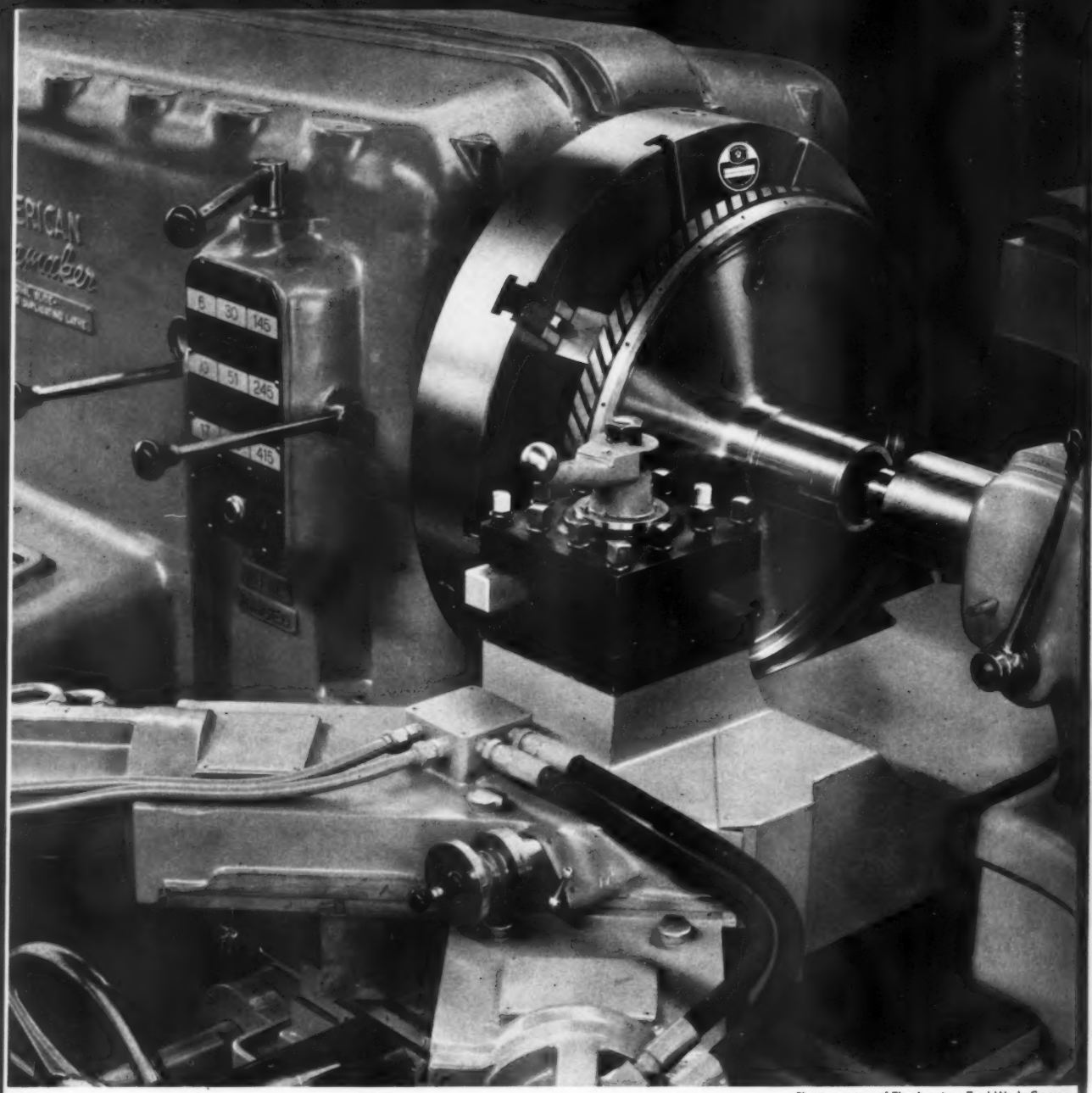


Photo courtesy of The American Tool Works Company

THE LATHE — *American Pacemaker 25" Style "G" Hydraulic Duplicating Lathe*

THE OPERATION — *Machining a jet engine compressor wheel*

THE CHUCK — *Horton, of course*

HORTON CHUCK DIVISION
Greenfield Tap and Die Corporation
Windsor Locks, Connecticut

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Since 1851
CHUCK

Call Your Horton Distributor Now!

ARROW
JET MIST Generator

Utilizes machine tool SUMP and SUMP PUMP

NO—Pressurized Coolant Tank

NO—Special Spray Heads

NO—Pressure Regulators

NO—Control Panel NO—Gauges

MODEL M-100 JET MIST GENERATOR now provides for an inexpensive, fast set-up method for cooler cutting at higher speeds with longer tool life at lower costs.

Simply and easily mounted to all types of machine tools and metal working machinery.

Send for Bulletin MG-1056.

ARROW TOOLS, INC.

1928 S. KOSTNER AVE. • CHICAGO 23, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1911

milling cutter Arbors

• made of alloy steel, heat treated for maximum toughness • precision ground to ensure concentricity of nose and taper shank • hardened drive keys securely held by cap screws • replaceable in case of damage

Flywheels

• Improve milling cutter performance • Increase cutting blade life • available in three styles, for mounting on the spindle of any machine

Write for Catalog No. 33

LOVEJOY TOOL COMPANY, INC.

146 Main Street, Springfield, Vermont

CIRCLE INFORM-A-GRAM KEY NO. 1912

TICKLISH FINISHING JOB?
do it better with a Paramount Felt Bob

If you have a tough polishing, buffing, lapping or de-burring finishing problem where tolerances must be held close, solve it by putting a Paramount Bob on the job. Seven custom shapes, 42 sizes, four degrees of hardness from soft to rock hard — there's a Paramount Bob ideal for every close-quarters precision finishing job. For example:

MICRO-FINISHING

Paramount Felt Bobs make ultra-fine finishing of surfaces quick, easy and economical.

DIE AND MOLD MAKING

Thousands of die and mold makers depend on Paramount Bobs to perform precision finishing and buffing operations. Ideal for removing burrs without destroying close tolerances.

NEW BOB ASSORTMENT KITS

K-1 Assortment includes 24 mandrel mounted bobs, 36 small wheels, touch-up pads — 66 pieces all together — packaged in one convenient bench top box. (K-2 Assortment also includes four sticks assorted polishing compounds.)

These handy assortments provide bobs of just the size, shape and hardness you want — and at $10.95 (K-1) and $12.95 (K-2) they are far below the cost of buying bobs separately.

See your jobber or write for literature

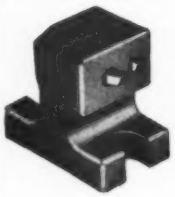
BACON FELT CO. **JOBBER INQUIRIES INVITED**

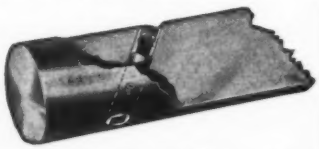
467 West Water St., Taunton, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1913

How SQUARE HOLED SLEEVES SPEED UP TOOL-MAKING!

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The Sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.





The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3/16, ¼, 5/16, ⅜, 7/16, ½, ⅝, ¾, 1"

●

STURDY BROACHING SERVICE, INC.
23516 TELEGRAPH RD., DETROIT 19, MICH.

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CIRCLE INFORM-A-GRAM KEY NO. 1921

• Write for literature on complete line of furnaces and ovens. Ask for Hints on Heat Treating.

Designed for TOOL ROOM EFFICIENCY

HUPPERT *Heat Treating* FURNACES

Range: 300° F. to 2000° F.

Years of satisfactory operation in tool, die and machine shops, as well as laboratories have proven these furnaces to be ideal for production work. Huppert special features include High Temperature, Heavy Duty Kanthal elements—Multi-insulation—counter-weighted and tight self-sealing door. Pilot lights indicate furnace operation. All connections factory installed, shipped ready for operation.

Model No.	Inside Dimensions			KW	Prices 220 volt single phase	
	Wide	High	Deep		With Huppert input controller	with electronic temperature controller
869	8"	6"	9"	4	$296.00	$480.00
11	8"	6"	12"	4	306.00	518.00
12*	8"	8"	12"	6	382.00	590.00
12A*	8"	8"	18"	9	490.00	698.00

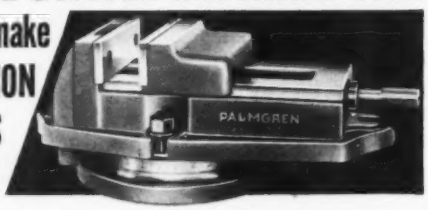
*For 2300°F. add $95.00 to No. 12 and $105.00 to No. 12A. No. 12A can be furnished for 3 phase at no additional cost. For floor model add $52.00 to above prices.

K. H. HUPPERT CO.
6820 Cottage Grove Avenue, Chicago 37, Illinois
Manufacturers of Electric Furnaces and Ovens

CIRCLE INFORM-A-GRAM KEY NO. 1923

PALMGREN

Here's a SWIVEL MACHINE VISE that will make PRODUCTION PROFITS for You



On such jobs as milling, drilling, grinding, shaping and other machine operations that require a rugged holding device. These famous heavy duty vises are precision built, can be used with or without the 360° swivel base, come in 2 jaw sizes, and speed up production wherever they're used.

NO. 40 ... 4" jaw, without base, **$69.95**
with swivel base, No. 40B, **$79.95**

NO. 60 ... 6" jaw, without base, **$89.95**
with swivel base, No. 60B, **$99.95**

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USED IN ALL INDUSTRIES...EVERYWHERE

There are 64 different models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories, comprising the most complete line available anywhere, with jaw sizes from 1½" to 8".

Ask for FREE CATALOG No. 205, complete with full details and prices

CHICAGO TOOL and ENGINEERING CO.
8388 SOUTH CHICAGO AVE. • CHICAGO 17, ILLINOIS

CIRCLE INFORM-A-GRAM KEY NO. 1922

The New SCHERR MICRO-PROJECTOR with the VERTICAL design

NEW 1957 SELF CONTAINED IMPROVED MODEL

FEATURING

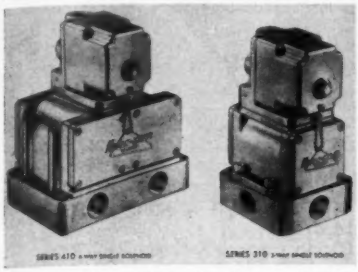
- ✓RIGID FLOOR BASE - ELIMINATING EXTRA CHARGE FOR TABLE
- ✓TILTING STAGE FOR HELIX, ANGLES AND BEVELS
- ✓4" DIA. STAGE OPENING
- ✓COLUMN SLIDE ADJUSTABLE FOR WEAR BY MEANS OF GIBS - WILL HOLD SQUARE INDEFINITELY
- ✓CUSTOM MADE PRECISION COATED LENSES & DOUBLE CONDENSERS FOR DIFFERENT OBJECTIVES 10 TO 100X MAGNIFICATION.
- ✓AN ENTIRELY NEW PRACTICAL DESIGNED TOOL FOR INSPECTION DEPARTMENT AND PRODUCTION SHOP.

WRITE FOR ILLUSTRATED FOLDER

GEO. SCHERR CO., Inc.
COMPLETE LINE OF PRECISION INSTRUMENTS
200-T LAFAYETTE STREET • NEW YORK 12, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1924

A New Line of Poppet-Type Air Control Valves has been introduced by Galland-Henning, Nopak Div'n, 2787 S. 31st St., Milwaukee 46. They are available for pressures to 150 psig, for 2-, 3- and 4-way operation

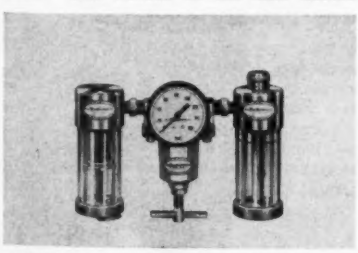


with master (air), single or double solenoid pilot control. Pipe sizes are from ¼" through ¾". The Nopakmatic valves feature complete pilot head interchangeability. All valve bodies have over-sized passages to assure full flow with minimum pressure drop.
Circle Inform-A-Gram No. A42.

Burn Out Broken Taps and Drills with a new disintegrating machine that is 8" long and 5" dia. Model J-1 is chucked into any drill press, connected to the water line, and plugged

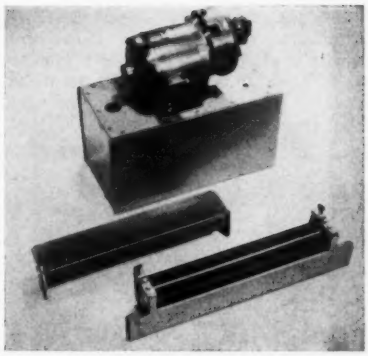
into a 115-v outlet. Jiffy Disintegrators, Inc., 1503 E. 11 Mile Rd., Royal Oak, Mich., or —
Circle Inform-A-Gram No. A43.

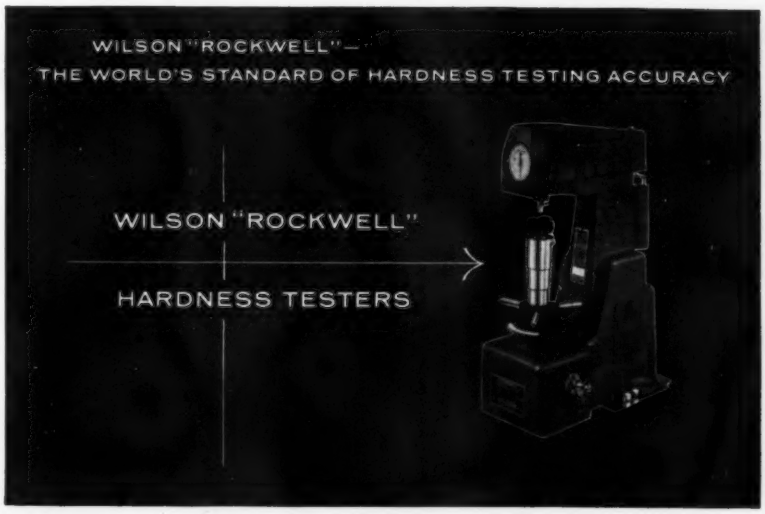
Filter and Lubricate Compressed Air to insure maximum efficiency and life of pneumatic equipment with a new series of Lubri-Air controls. The series of air-line filters



and lubricators are available in four port size models — ⅛", ¼", ⅜", and ½". The Bellows Co., Akron 9, O., or—**Circle Inform-A-Gram No. A44.**

Protect Dies and Save Lubricant with a new motorized lubricator for all types of presses employing roll feeds. It assures adequate lubrication of coil stock by providing a continuous, even amount of lubricant to the stock before it enters the press. Eliminated is excessive die wear and shearing of punches. The motorized lubrication minimizes downtime in high-speed automatized stamping operations. Brandes Press Co., 6408 Euclid Ave., Cleveland, or —
Circle Inform-A-Gram No. A45.





A FULL WILSON LINE TO MEET EVERY HARDNESS TESTING REQUIREMENT

FULLY AUTOMATIC
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SEMI-AUTOMATIC
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SPECIAL
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SUPERFICIAL
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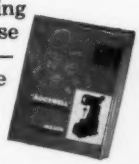
MICRO & MACRO HARDNESS TESTERS

For easy, accurate production tests

Sensitive and Accurate as a precision balance —the WILSON "Rockwell" hardness tester insures the quality of your products and protects your good name as a manufacturer.

Durable as a machine tool—WILSON "Rockwell" hardness testers withstand severe daily use with a minimum of service requirements.

A staff of WILSON hardness testing experts is available to help choose the model best suited to your job—and provide quick emergency service if it is ever needed.



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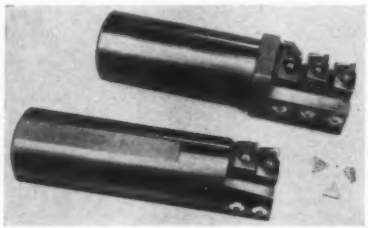
ACCO for Better Values

Wilson Mechanical Instrument Division
AMERICAN CHAIN & CABLE

230-TP Park Avenue, New York 17, N. Y.

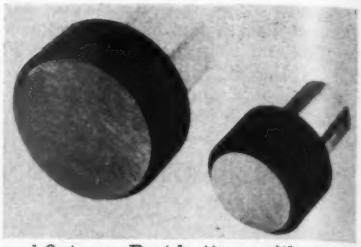
CIRCLE INFORM-A-GRAM KEY NO. 193

Obtain Precision Finishes with Minimum Tool Cost and Downtime for tool changes with micro-adjustable boring tools. Multi-diameter boring operations and chamfering can be combined in the same tool.



Throw-away inserts requiring no grinding are used. Once set on the job, the anvils or bars require no adjustment. The boring bars can be applied to all types of turret lathes, horizontal or vertical. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich., or —
Circle Inform-A-Gram No. A46.

Jig and Fixture Rest Buttons are offered in two types and a complete range of sizes by Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10. They are used as cutter set gage blocks and as locating parts in jigs



and fixtures. Rest buttons with shank are made in 16 sizes and special jig rest buttons can be ordered with drilled and C bored hole for socket head screw in a complete range of 18 sizes.
Circle Inform-A-Gram No. A47.

Mechanize your Thread Gaging

with

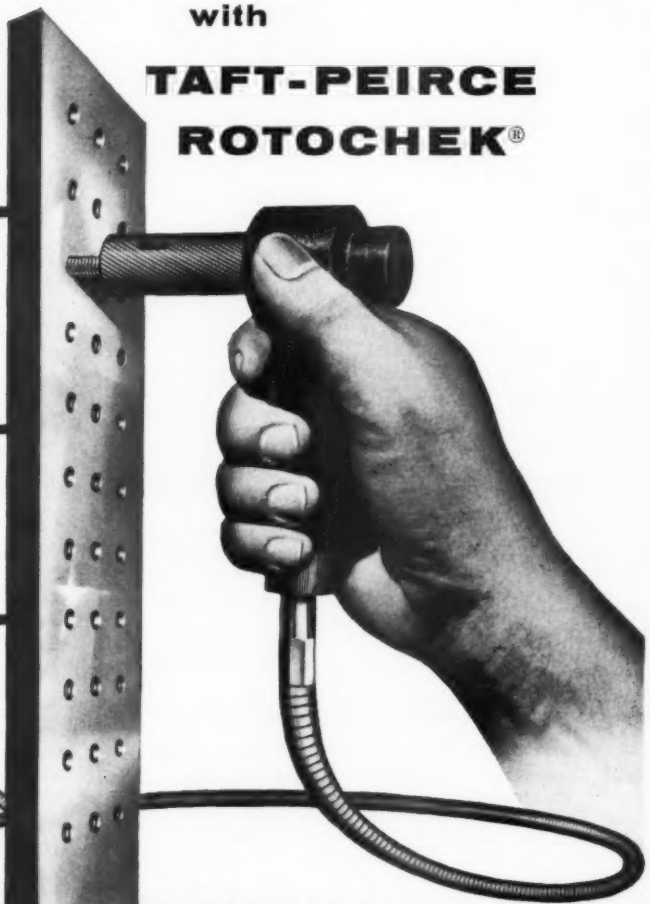
TAFT-PEIRCE ROTOCHEK®

Electrolizing gives extra "Life-Value" to your thread gaging — adds substantially to accurate wear life, many report up to three times or more. Costs little extra.
Plus minimum friction, high degree of corrosion resistance.

Adjustable Thread Ring Gages can be used with the Rotochek to mechanize inspection of externally threaded parts.

Carbide Thread Plug Gage wears far longer under conditions of abrasion or day-in, day-out repetitive gaging. From #8 screw machine size up.

Rotochek is world's fastest thread gaging device. Available in bench or flexible shaft models. Uses standard ring and plug gages.



This Taft-Peirce Gaging System brings remarkable speed and savings to your whole inspection program. Threads can be gaged *three times faster* with the T-P Rotochek. Power does the rotating automatically instead of by hand — a simple push-pull and the part is checked. But look further, too. Standard gages — thread plug (taper shank and reversible) and thread ring gages can be used with Rotochek to cut costs at almost every step in your inspection.

Get the Facts on Mechanized Gaging!
Let T-P prescribe the one best combination of speed, wear-resistance, accuracy and simplicity for your program. Get started, today, towards a new look at your gaging system. For complete details, write: Taft-Peirce Mfg. Co., Woonsocket, Rhode Island.

TAKE IT TO TAFT-PEIRCE

T-P Means TOP Precision

IT'S PLAIN TO see

A Boring Head That Won't Face is NOT Complete

NOW you can get a boring head that will BORE, FACE, TURN and GROOVE at no more cost than you would pay for a plain, single purpose boring head.

LOOK INTO THIS before you buy that new head. Write for full details.

CHANDLER TOOL CO.
Muncie, Indiana, U.S.A.

Chandler-Duplex
COMBINED BORING AND FACING TOOLHEADS

CIRCLE INFORM-A-GRAM KEY NO. 1951

GATCO ROTARY BUSHINGS

For DRILLING, CORE DRILLING, ROUGH and FINISHED BORING

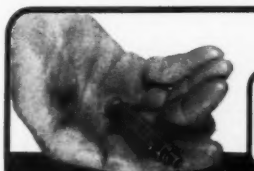
The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work — or both.

Eliminates expensive tool construction — Reduces tool wear — Prevents seizure and pilot breakage — Especially adapted where precision is required.

Write for full information and prices

GATCO ROTARY BUSHING CO.
42322 ANN ARBOR RD., U. S. 12, PLYMOUTH, MICH.
Telephone PLYMOUTH 1472

CIRCLE INFORM-A-GRAM KEY NO. 1952



You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 6 to 1" N.C. In all S. A. E. sizes.

Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1953

PRESSURELOK-224

the best diamond wheel ever developed for carbide tool grinding. Guaranteed ultimate cutting life from each diamond particle in every wheel.

UNITED STATES DIAMOND WHEEL CO.
1833 ILLINOIS AVE. AURORA, ILL.

US

IMMEDIATE DELIVERY on all wheel sizes. STRAIGHT, DISH, CUP, FLARE and MOUNTED WHEELS; HONES.

CIRVLE INFORM-A-GRAM KEY NO. 1954

Make 3 hammers AT ONCE!

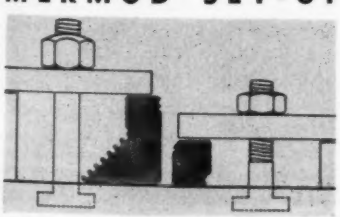
It's the NEW, easy, economical, quick way to mold your own lead hammers on a production basis with "SHUR-GRIP" handles and this COOK production mold.

Write for circular and prices

LAWRENCE H. COOK, INC.
60 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1955

MERMOD SET-UP BLOCKS



- Adjustable in steps of 1/25"
- Rounded teeth fit and mate perfectly
- Case hardened and tempered steel

ELIMINATE HUNTING FOR PROPER STRAP SUPPORTS AND REDUCE SET-UP TIME TO A FRACTION

Eliminate inaccuracies and accidents due to improper strapping

WHY NOT INCREASE YOUR PRODUCTION ACCURACY AND PROFITS?

Sole U.S.A. Representatives:

NEISE MODERN TOOLS **KARL A. NEISE** 404 4th Ave., Dept. TP New York 16, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1956

NOW GET CLEAN SURFACED PARTS FROM YOUR AUTOMATICS ... *UNMARRED* BY TOOL WITHDRAWAL MARKS

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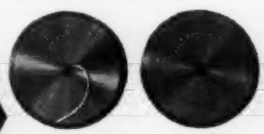
SAVES YOU COSTLY SECONDARY FINISHING OPERATIONS



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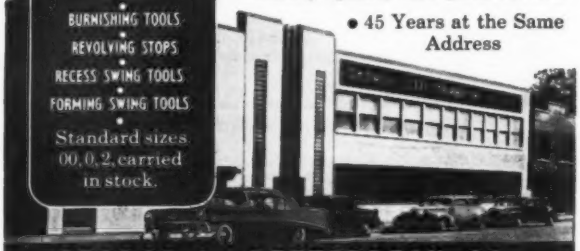

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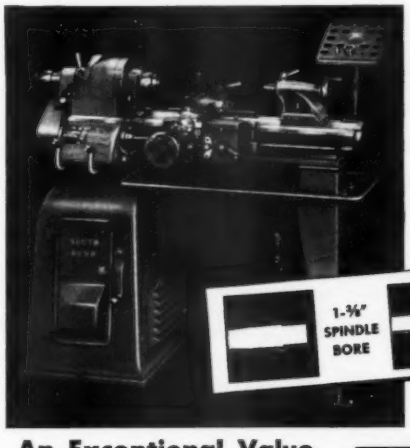

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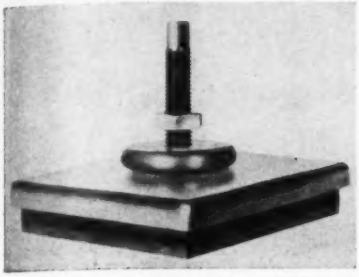
Building Better Tools Since 1906

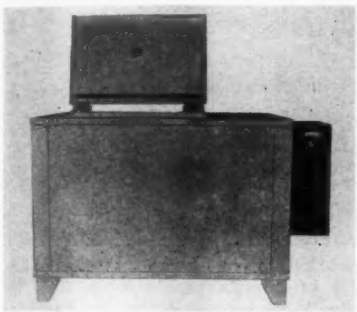
CIRCLE INFORM-A-GRAM KEY NO. 1963

A Self-Leveling Machinery Mount has been announced by The Felters Co., Unisorb Div'n, 210 South St., Boston 11. The Level-Rite is designed in seven models with loading ranges from 800 to 7500 lbs per unit,



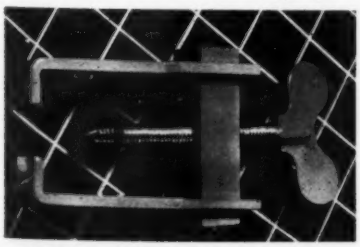
and in four sizes. One unit is required for each machine leg or mounting point. It consists of an all-steel base unit with leveling screw and leveling plate, combined with Unisorb vibration-dampener pad. **Circle Inform-A-Gram No. A50.**

A Top-Loading Oven has been produced by Grieve-Hendry Co., Inc., 1401 W. Carroll Ave., Chicago 7. The oven permits loading and unloading down from the top, either manually



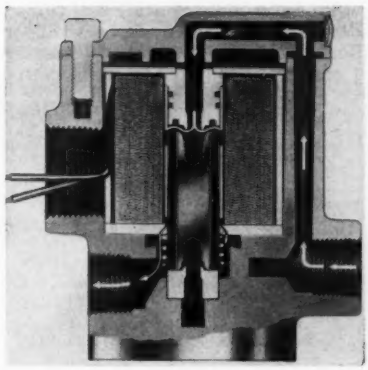
or by means of an overhead hoist. The oven shown has adjustable horizontal air circulation through the work space. The new type ovens are built to individual size requirements. **Circle Inform-A-Gram No. A51.**

Remove Gears and Pinions from Shafts or Studs with this small precision Model Makers gear puller. The tool will handle gears having an O.D. of 2⅛". It has a stripping or



pulling capacity of 2". The gear puller is designed primarily for small instrument and model makers. Dayton Rogers Mfg. Co., Minneapolis 7, or—**Circle Inform-A-Gram No. A52.**

Continuous Internal Cooling of the solenoid coil and self-cleaning effect of the actuating plunger prevents overheating and assures trouble-free service for Speed King solenoid pilots. They are capable of handling air, vacuum, oil, water and inert gasses, for direct, sub-base or manifold mounting. The solenoid pilots are available in 2 and 3-way types for separate pilot control applications. Valvair Corp., 454 Morgan Ave., Akron 11, or —
Circle Inform-A-Gram No. A53.



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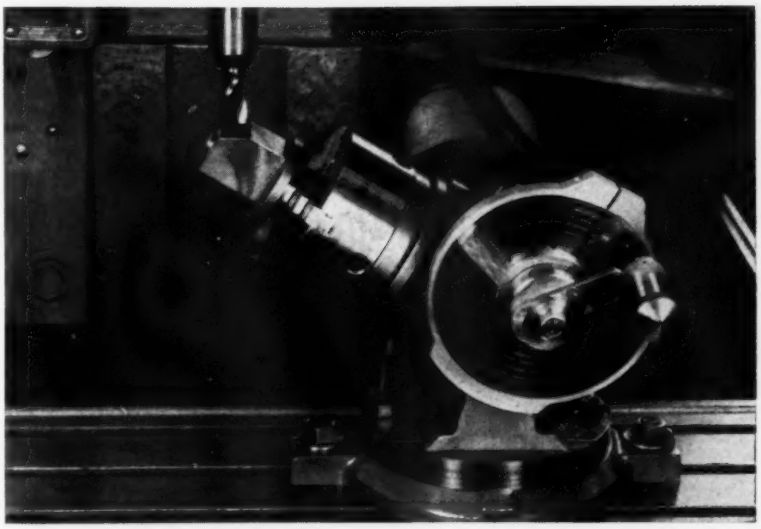

The Ellis Dividing Head is made for precision operations: The Buck 3-jaw chuck adjusts to dead true precision in 1 minute. Put the two together and you have a real performing team.

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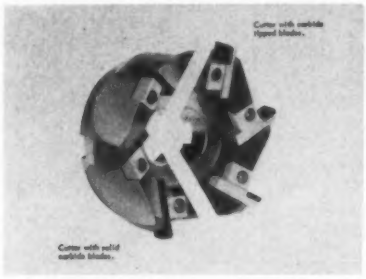
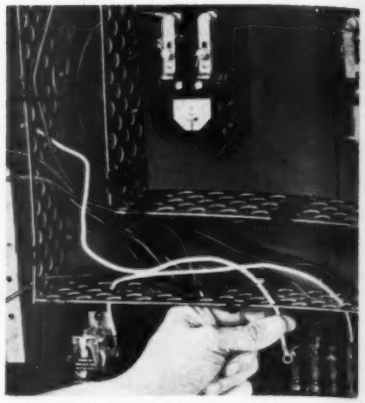
CIRCLE INFORM-A-GRAM KEY NO. 197

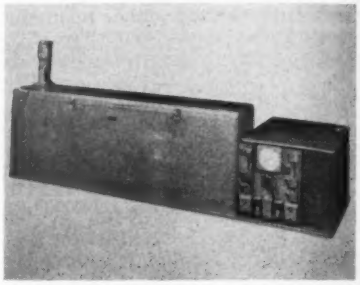
Solid Carbide or Carbide Tipped Blades can be used by the new Eager Beaver face milling cutter, featuring a change in the wedge. One cutter can be used to cut all types of materials, including steel, cast iron, brass, bronze, aluminum and magnesium. The milling cutter has fast blade setting which reduces machine downtime, and individual adjustment to thousandths or any amount needed. Beaver Tool & Engineering Corp., Box 429, Royal Oak, Mich., or — **Circle Inform-A-Gram No. A54.**



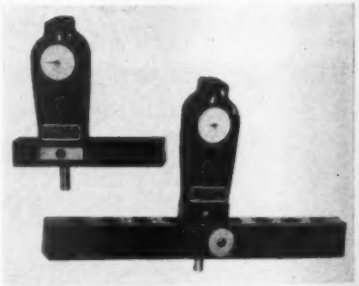
The Channel-Duct, a three-sided wiring duct for simplifying panel wiring, is now available in a 2" high size as well as the 3" one. It provides a means for lowering fabrication and assembly costs in the production of control panels. The Channel-Duct replaces hand-formed solid wire layouts, and eliminates expensive harnesses. The Glastic Corp., 4321 Glenridge Rd., Cleveland 21, or —**Circle Inform-A-Gram No. A55.**



New Advantages in Stainless Steel Hardening are offered by a new low-temperature chilling machine. Model 3SR-120-47 is also suited for use in any type of production chilling operation. It has a net thermal capacity of approximately 6,000 BTU/hr at 120°F, with a 47 cu ft chamber. Cincinnati Sub-Zero Products, 3930 Reading Rd., Cincinnati 29, O., or — **Circle Inform-A-Gram No. A56.**



Select an Indicator Depth Gage for almost any part condition by using a standard series of interchangeable gage components from A. G. Davis Gage & Engineering Co., 21435 Dequindre Rd., Hazel Park, Mich. By varying the components, over 3500 depth gages can be specified to gage special dimensions. No alteration of standard components is required. Design drawings are eliminated in most cases. **Circle No. A57.**



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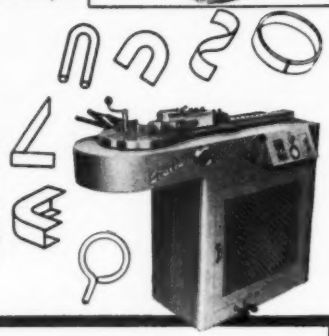

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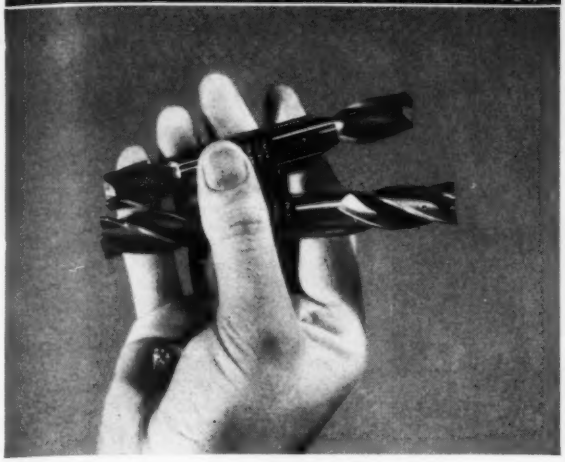
CIRCLE INFORM-A-GRAM KEY NO. 198

YESTERDAY'S PIONEER · · · TODAY'S LEADER



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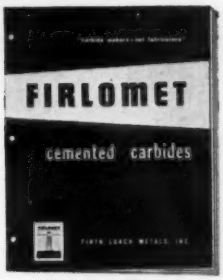

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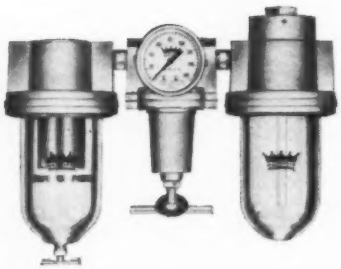

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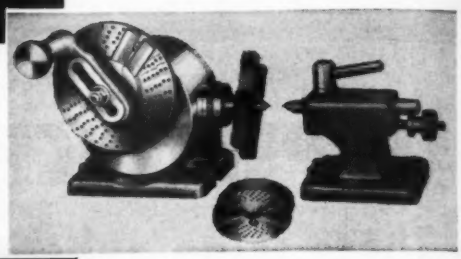

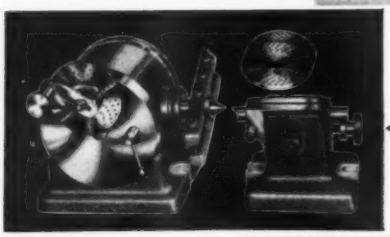

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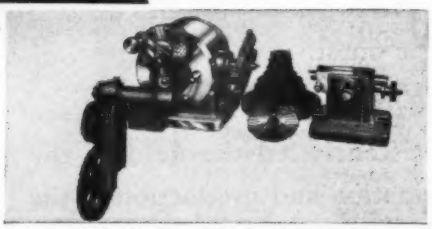

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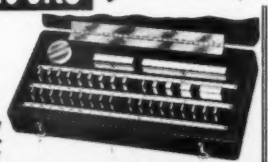

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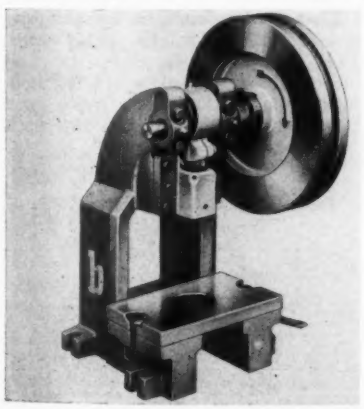
tant to chemicals and abrasion. The barrels are available in open conical or closed types. Rampe Mfg. Co., 14915 Woodworth Ave., Cleveland 10, or—**Circle Inform-A-Gram No. A58.**

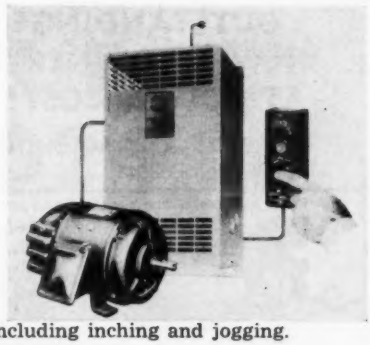
Sensitive Control and Quick Tight Shut Off are advantages of a new micro valve. Model 167 is used on automatic feed mechanisms, accurate filling operations, and pilot control of main valves. Other applications include use as pilot for diaphragm valves, control of single acting cylinders, and timing mechanisms. The micro valve functions as either a 2-way shut off or 3-way control. Operating pressures range from 0-100 psig. Barworth, Inc., 7 Industrial Pl., Summit, N. J., or —
Circle Inform-A-Gram No. A59.

Operations Requiring a Wide Gap between Column Members are handled by a 2-ton fixed bed, gap frame press. It provides an opening 4½" wide through the back to accommo-



date sizeable coil or sheet stock. The press has a standard stroke of ¾", and operates at 280 to 290 strokes/min. Benchmaster Mfg. Co., 1835 W. Rosecrans Ave., Gardena, Calif., or—**Circle Inform-A-Gram No. A60.**

A Re-Designed Variable-Speed Electronic Drive has been announced by Reliance Electric and Engineering Co., 24701 Euclid Ave., Cleveland 17. The heart of Model V*S Jr. is a printed circuit board which means more fool-proof, higher-quality construction with fewer wires and hand-soldered connections. The drive motor is of constant flux design, expressly made for use on rectified power. Model V*S Jr. has its maximum size boosted from 3 to 4 hp. It gives a wide-range adjustable feed for all machine applications requiring precise control of variable speeds, including inching and jogging.
Circle Inform-A-Gram No. A61.



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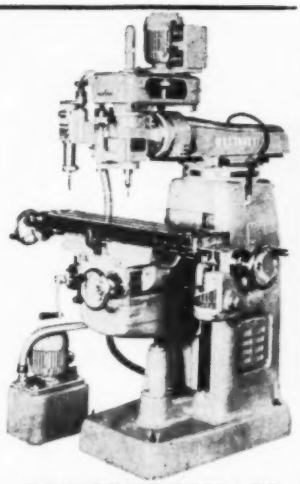

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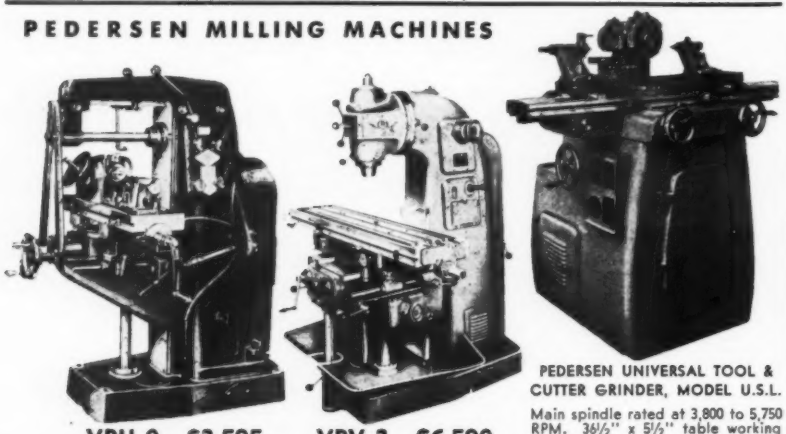

VPU-0 **$2,595.** VPV-2 **$6,590.**

PEDERSEN UNIVERSAL TOOL & CUTTER GRINDER, MODEL U.S.L.

Main spindle rated at 3,800 to 5,750 RPM. 36½" x 5½" table working surface. **$2,595**

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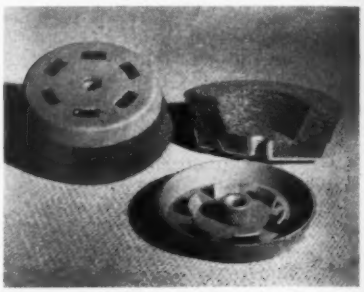
Gage Thickness Automatically with ultrasonic test equipment with detection and recording devices attached. These will spot thickness changes in metals and plastics as

small as .05 of 1%, and can be connected to ring an alarm, flash a signal light or activate compensating controls of various sorts. Branson Instruments, Inc., 37 Brown House Rd., Stamford, Conn., or —

Circle Inform-A-Gram No. A62.

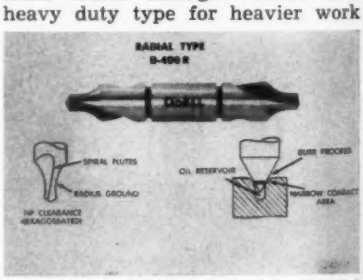
A Reinforced Grinding Wheel featuring Safety Back flared cup wheel construction is now available. It offers the greatest initial strength and highest degree of safety for the operator. The steel backed threaded steel insert provides convenient and



secure mounting. For details, see Bulletin 7157 supplied by Raybestos-Manhattan, Inc., Manhattan Rubber Div'n, Abrasive Wheel Dept., Passaic, N. J., or —

Circle Inform-A-Gram No. A63.

Cost Reduction and Longer Life are features of safety center drills. They incorporate design features that eliminate deburring, grinding and lathe center damage. There is a heavy duty type for heavier work



and the radial type (shown, Model D-400R) for precision work. Both insure higher cutting efficiency through their helical relief on the cutting edge. The DoAll Co., Des Plaines, Ill., or —

Circle Inform-A-Gram No. A64.

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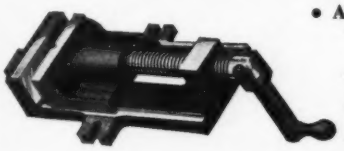

• **Available in two sizes:**

No.	Jaw Width	Max. Opening
1D	3½"	4"
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• **Developed expressly for use on drill press operations.**

YOST MFG. CO. 124 Grant St., Cambridge Springs, Pa.

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Guaranteed Accuracy Within .001" Reading .001"

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MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost. Same Accuracy Guaranteed!

The B943 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table. The swivel base, which is graduated 90° one side of center and 45° on the other, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired. The B943 is easily and quickly mounted on other makes of grinders.

The No. 11 B & S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. Unit is grease packed at factory and requires no service in the field for the life of the bearings. Streamlined in design, this fixture is quickly mounted and is easy for the operator to keep clean.

The special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor operates quietly and is fully protected from dust and from any oil entering from working parts.

See this extremely accurate B943 work head at your equipment dealer or write for complete literature.

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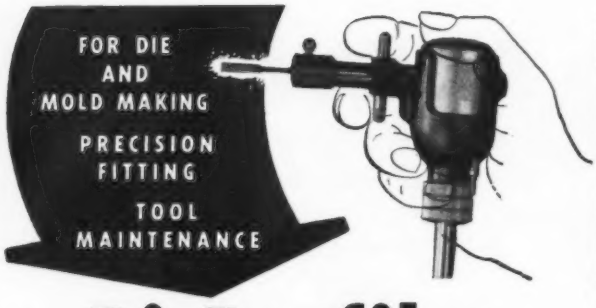

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Fast, accurate, versatile

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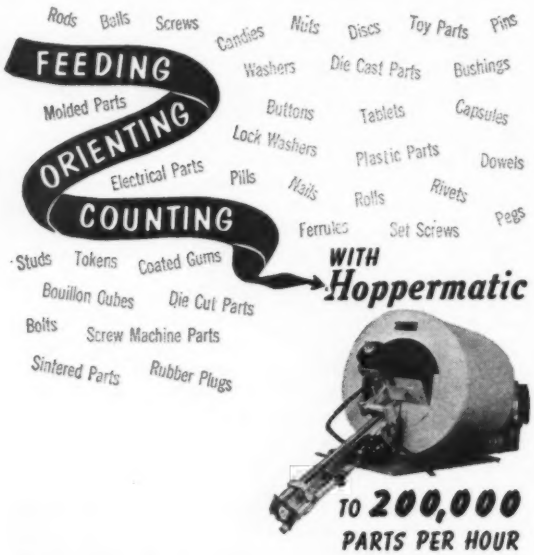

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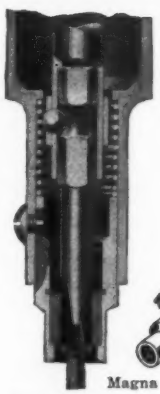
For driving slotted screws

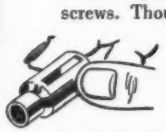
MAGNA FINDER

does it easier, cheaper



The Magna Finder picks up the screw, positions it...so that with one-hand control the bit automatically enters the slot of the screw and drives it home. Alnico Magnet has ten times ordinary "pull" and positively positions screw. Results? Production up, costs down.

Interchangeable with regular power screwdriver finders. Available for *all* makes of power drivers and *all* kinds of screws. Thousands in use. Ask your power screwdriver salesman for a demonstration of the complete Magna Driver line.

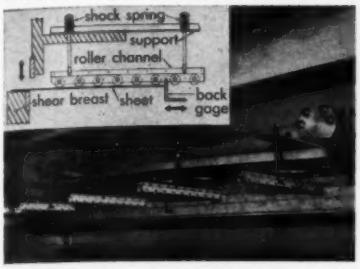


Magna Finder—U.S. Patent #2,671,484

NEW manual ready; write Dept. 88-F. Complete information on Magna Bit Holders, Finders, Sockets and Hand Screwdrivers. Magna Driver Corporation, 779 Washington Street, Buffalo 3, N. Y.

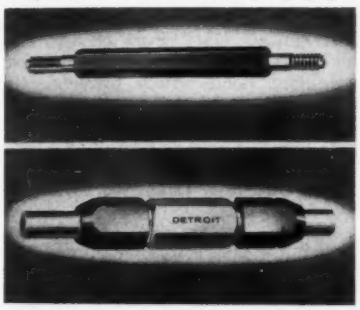
CIRCLE INFORM-A-GRAM KEY NO. 2044

Speed Up Shearing of Light and Medium Weight Sheet Steel as heavy as 14 ga with a new line of magnetic roller channels. They are easily installed on any shear. As the sheet to be cut is fed through the shear, the



magnetic rollers seize and guide it into position against the back gage. Their use results in faster, safer and lower cost shearing. The roller channel assemblies are offered in standard lengths of 24", 36" or 48". Magni-Power Co., Wooster, O., or —
Circle Inform-A-Gram No. A65.

Carbide Plug and Thread Gages have been added to the line of chrome-cobalt steel threading tools and gages produced by Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Baseline, Mich. The carbide plug gages



are made in two types. The thread plug carbide gages are available in taperlock, trilock, and reversible types.
Circle Inform-A-Gram No. A66.

A Complete Stock of Flexible Couplings is being offered by PIC Design Corp., 477 Atlantic Ave., E. Rockaway, N. Y. Type BH is precision bored to a ±0.0002" tolerance

and comes in three shaft sizes, 1/8", 3/16", and 1/4" dia. The couplings control shaft-to-shaft misalignment and isolate torsional vibration. In addition, they allow insulation between units.
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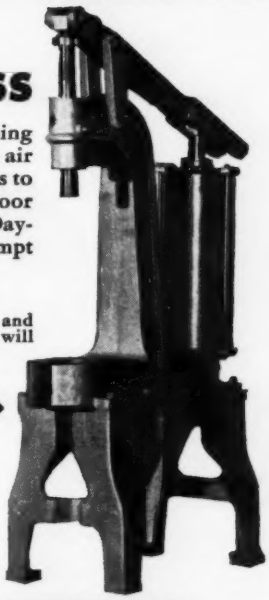
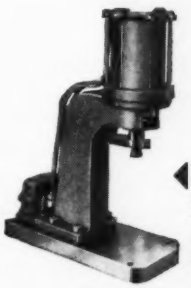
SAVE!

WITH A HANNIFIN AIR PRESS

It's the ideal press for that occasional pressing job. These presses operate off ordinary shop air supply. They're fast and safe. Over 30 models to choose from...many for either bench or floor mounting. Capacities from ½ to 18 tons. Daylight to 46 inches...reach to 12 inches. Prompt delivery.





WRITE. Complete information and prices on Hannifin Air Presses will be sent on request.

6 Tons (Model B-2) One of more than 30 models. Press with base, $570.

1-ton Hand-D-Press. For small parts manufacturers. Press only, without valves, $230.

Prices F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

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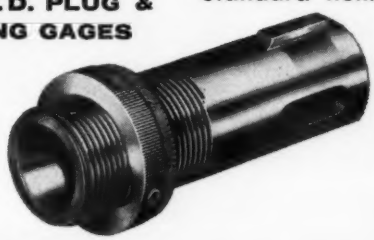
— when you order your duplication requirements for these Standard Items...

A. G. D. PLUG & RING GAGES



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Adjustable Adapter Sleeves and Nuts

"Economy" stocks always complete to assure immediate delivery. Worn-out plugs and ring gages salvaged at low cost.

Ask about the new "Economy" Extended O.D. Symbol Range. Dimensional Data Sheet No. 7-A Upon Request.

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1828 SOUTH 68th STREET
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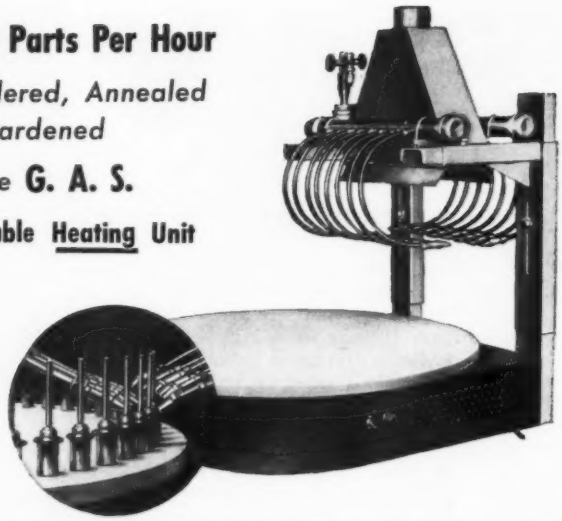
CIRCLE INFORM-A-GRAM KEY NO. 2052

Up to 1,000 Parts Per Hour

Brazed, Soldered, Annealed or Hardened

with the **G. A. S.**

Utility Turntable Heating Unit



Close-up of unit silver-brazing a gasoline drain and feed pipe assembly at a production speed of 450 units per hour.

This high output, low cost unit will heat up to 1,000 parts per hour depending on the size and shape of the part. Then, when you are through with production on one part, in 5 minutes time the unit can be changed over to another — it is just that easy.

Simple fixtures on the transite hold the work. When changeover is required, the transite complete with fixtures, is easily removed and replaced by another complete setup.

The gas manifold with its 16 burners is quickly adjustable horizontally and vertically to suit different parts.

The turntable drive is variable to meet various heat requirements.

This is one of the many versatile, efficient production heating units built by G.A.S. and requires only a small initial investment. Learn how it will answer your production heating problems — write for Bulletin No. 512.

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Industrial Gas Engineers

1936 West Balmoral Avenue Chicago 40, Illinois

REPRESENTATIVES IN MAJOR INDUSTRIAL AREAS

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Many uses —

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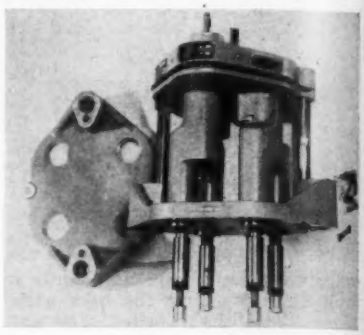
Multiple Lead Screw Tapping of several parts with similar but varied hole patterns can be done with an adjustable multiple spindle head. A spindle travel of 1½" is controlled by a rotary limit switch operated



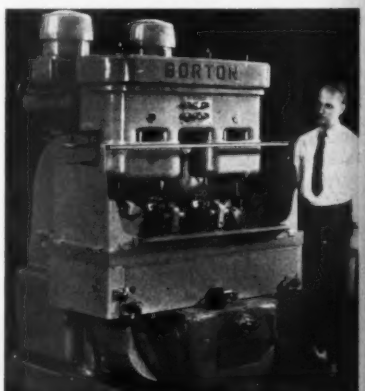
through a special shaft. The photo shows two holders completely retracted with the other two in normal operating position. Thriftmaster Products Corp., 1012A N. Plum St., Lancaster, Pa., or —

Circle Inform-A-Gram No. A68.

Separate Work and Chips from automatic screw machines with up to 99% efficiency with a new chip separator. Eliminated is hand riddling and picking of screw machine and similar work from chips. The machine features a newly designed extended hood which prevents air blast back pressure and the possibility of chips flying out of the vibrating loading pan. Ransohoff, Inc., Hamilton, O., or —

Circle Inform-A-Gram No. A69.

Mill Out Two Recesses in Beveled Gear Blanks approximately 3" dia with a special 4-spindle vertical milling machine. The machine will produce up to the top speed of the operator who unloads and loads two fixtures while two workpieces are being



machined in the other two fixtures. Production is 200 pcs/hr. Infinitely variable feeds are available up to the capacity of any existing cutters. George Gorton Machine Co., Racine, Wis., or —

Circle Inform-A-Gram No. A70.

NOW

BUILD YOUR OWN PRODUCTIO MACHINES WITH HARTFORD "OFF-THE-SHELF" COMPONENTS

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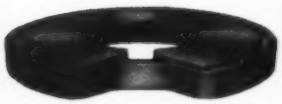
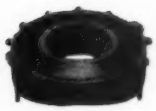


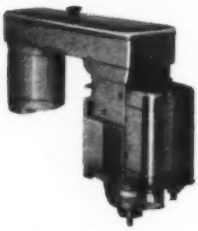
Circular Base Top



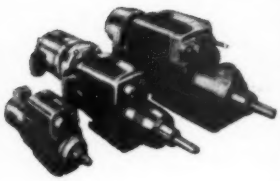
Index Table Support

Pedestals

Unit Mounting Adapters

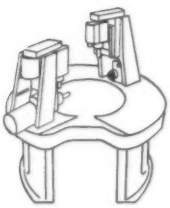


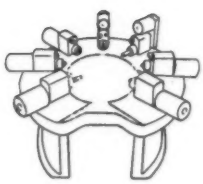
Integral Motor Mounts



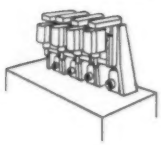
Automatic Air-Hydraulic Drill Units

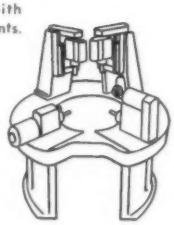
Automatic Cam Type Drill Units





Four of the many machine setups possible with Hartford Components.





HARTFORD SPECIAL now offers a complete high production automatic processing machine in knock-down form, ready for assembly on your floor. The production-tested components and elements illustrated above are available *from stock*, and are the same standard machine equipment from which Hartford's line of complete automatic drilling and tapping machinery is made.

For the plant that is plagued by model changes or setup costs, these preengineered components can offer unlimited time and cost saving. "Building block" construction allows you to build a production machine to your own design or needs on the spot, when and where you need it. Call in Hartford now, and take advantage of our offer to produce better products at lower cost through better methods.

HARTFORD Special

Hartford also makes automatic Thread Rolling Machines, Special Machinery and the world famous Super-Spacer.

Machine Tool Division
THE HARTFORD SPECIAL MACHINERY CO.
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Send me data sheets and complete information your "off-the-shelf" components.

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THESE 40-TON PRESSES take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are very *moderately priced.*

Significant savings may result if you let our engineering staff assist you. There is no obligation.

Rousselle Presses are sold exclusively through leading machinery dealers.

Choice of 25 models in 5 to 40-ton sizes.

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CIRCLE INFORM-A-GRAM KEY NO. 2091

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MALLEABLE MACHINE HANDLES

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Includes scores of other tool room needs such as plastic and steel ball handles, C.I. hand knobs, C.I. hand wheels, compression springs, balanced cranks, clamping levers, etc.

Quality at *Moderate* Prices!

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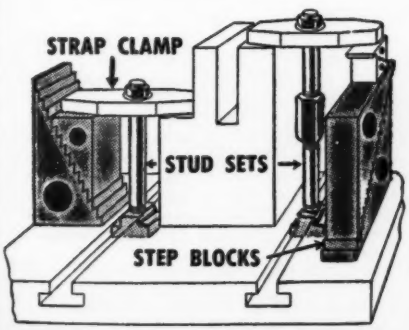
REID TOOL SUPPLY CO. Muskegon Heights, Mich.

CIRCLE INFORM-A-GRAM KEY NO. 2092



SURE-GRIP STEP BLOCKS

Clamping tools of all types.

Write for free tracing templates

TIETZMANN TOOL CORP.
Box 277
North Main St., Englewood, Ohio

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Now available in 182 standard sizes to meet your exact requirements

ACE

hardened high speed steel DRILL BLANKS

These versatile, low-cost drill blanks are made of top quality, uniformly hardened high speed steel precision ground to exacting tolerances to meet the requirements of countless applications. Ideal for use as dowels, punches, knockout pins, gages, and rollers. Readily adaptable to form a wide variety of end cutting tools, too. And they're offered now in 182 standard stock sizes and in sets as shown.

Call your local Ace Drill Distributor today!

NEW CATALOG covers the entire line of Ace "Ground-from-the-Solid" High Speed Steel and Carbide Drills, Reamers, Drill Blanks and Special Drills. Send for it today!

ACE DRILL
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 2094

MANUFACTURING MEMOS

Name Changes . . .

● Globe-Wernicke Industries, Inc. will be the new name of The City Auto Stamping Co. of Toledo, Ohio, effective in July.

● The name of Olin Revere Metals Corp. has been changed to Ormet Corp. Ormet is jointly owned by Olin Mathieson Chemical Corp. and Revere Copper and Brass, Inc. With completion of plants at Burnside, La., and Omal, Ohio, the firm will produce 180,000 tons of primary aluminum a year. Of this, 120,000 tons will be delivered for fabrication to Olin Mathieson and 60,000 tons to Revere.

Contributions to Colleges . . .

● The nation's colleges have received almost $800,000 in the last two years from contributions from General Electric Co. Of this total, nearly $400,000 was given by employees and a matching amount was a gift of the Corporate Alumnus Program of the General Electric Educational and Charitable Fund, which was established in 1954. College alumni employed by the company made 5,078 gifts to 361 colleges last year.

Standardizes Miniature Ball Bearings . . .

● New Hampshire Ball Bearings, Inc. has announced that it has standardized its entire production of miniature ball bearings at Class 7 standards. This has been established by the Annular Bearings Engineers Committee as the highest quality level for miniature bearings.

Opens Western Division . . .

● Weldaloy Products Co. has established a new plant in Burbank, Calif., which will serve as headquarters for the newly-created Western Division. It will service customers in the automotive, aircraft, appliance, and the tube and pipe fabrication fields. Weldaloy produces huge copper alloy tube mill electrodes used in electric welding of large and small pipe and tubing, and inner and outer conductors for tube mills.

Use of Gage Blocks Increases . . .

● A more than 400% increase in the use of gage blocks in the last five years has been noted by E. Ellstrom, president of Dearborn Gage Co. He reports that the increase is a result of the constant growth in the number and range of on-the-job measurement problems throughout industry. Now many companies maintain a large "bank" of sets for plant-wide applications.

An eastern branch office of Autonetics, a division of North American Aviation, Inc., has been established in Washington, D.C. In charge of this office is Norman P. Hays. Its primary function will be to provide coordination within Autonetics of the needs of military and civilian agencies of the federal government, as well as eastern airframe manufacturers, for guidance, armament and flight control, and other specialized electromechanical equipment.

◆

L. A. Young Spring & Wire Corp. has acquired license rights to manufacture and sell the patented Neg'ator constant-force spring for high volume automotive applications. The company will undertake a program to research and test the spring device for use in automotive parts such as car windows, seat tracks, and brakes. The license rights were obtained from Eastern Metals Research Co., Inc. of New York City.

◆

The main office of Van Norman Industries, Inc. has been moved from Springfield, Mass., to New York City.

◆

The Weatherhead Co. has purchased the assets of the Plew Tool Co., Inc. of Columbia City, Ind. The new company will be known as the Plew Tool Corp. The Plew plant produces both standard and special cutting and forming tools. In addition, it is well known in the field of custom heat treating.

◆

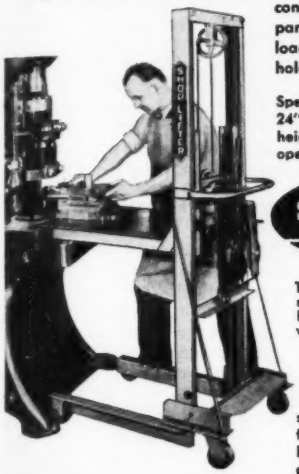
Two sales and service offices have been opened by Burg Tool Mfg. Co., Inc. of Gardena, Calif. The offices of the Burgmaster Ohio Sales Division are located in Cleveland and those of the Michigan Sales Division, in Detroit. They are under the direction of James M. Walder and John F. Morris, respectively.

◆

The sale of Hufford Machine Works, Inc. to Pacific Industries, Inc., with headquarters in San Jose, Calif., has been disclosed. Hufford's products and services are widely used by the aircraft and missile industry. Included in the sale are the Hufford-owned Smith-Nelson Corp., Vacu-U-Lift Co., and Fonda Corp. These firms have become divisions of Pacific Industries.

500 lb. Lifter-
NOW $210 f.o.b. Chicago

Pays for itself over and over again in time saved and by avoiding lifting injuries in moving dies, machine parts and stacking. Can be used as adjustable height work table. Rugged, simple construction, with few moving parts, has high safety overload factor. Automatic clutch holds load at any height.



Specifications: platform 24" x 24", lifting height 4' 6". Overall height 6' 0". Width 24". Foot operated floor lock.

SHOPLIFTER

This sturdy, general purpose lifter makes it easy for one man to handle lifting jobs quickly and with complete safety.

Order Today—
Free Trial

specify 10 day free trial, with full credit return privilege. 1000 lb. and 2000 lb. Shoplifters also available.

ECONOMY ENGINEERING 4509 W. LAKE ST. Chicago 24 Illinois

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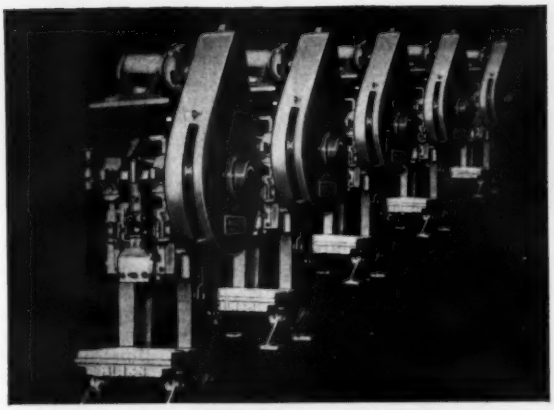


BLISS' ALL-NEW LINE OF BENCH PRESSES OFFERS FAMOUS BIG PRESS FEATURES

- Six models: Bench presses and adjustable bed and horn presses in up to ten ton capacity
- Split bronze bushings in frame and connection bearings
- Bliss Rolling Key Clutch—performance-proved on thousands of Bliss inclinables
- Extra long "V" type removable gibs
- Extra long slide with removable connection screw, ball seats and removable clamping caps
- Roll feeds, die slides and other accessories

SEND FOR FREE LITERATURE: BULLETIN No. 1-A

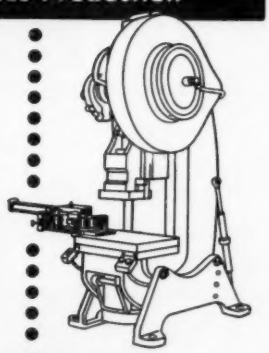
BLISS SINCE 1857 *100 years of making metal work for mankind*

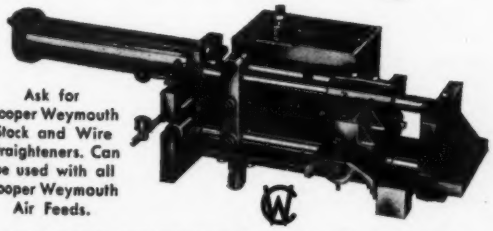
E. W. BLISS COMPANY
San Jose, California

CIRCLE INFORM-A-GRAM KEY NO. 2113

COOPER WEYMOUTH
AIR OPERATED SLIDE FEEDS
Boost Power Press Production

Specifically designed to solve the automatic feeding problems in press rooms. Simplified, open throat construction. Air operated from standard shop lines. Easily set up and adjusted at the front, rear or sides of press for accurate long or short runs. Cooper Weymouth Air Feeds, made in five sizes, will feed lengths up to 36", of stock up to 18" in width. They are readily adaptable to material of irregular cross section and ideal for use with hydraulic presses.





Ask for Cooper Weymouth Stock and Wire Straighteners. Can be used with all Cooper Weymouth Air Feeds.

SEND FOR INFORMATION ON THESE AND OTHER PRODUCTS

COOPER WEYMOUTH, INC.
600 HONEYSPOT ROAD, STRATFORD, CONN.

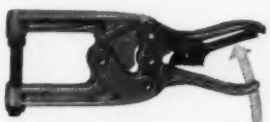
CIRCLE INFORM-A-GRAM KEY NO. 2112

KNU-VISE insta-release *PLIERS:*

easy to open—quick to re-clamp

insta-release—that's the name for the easy-action release-lever Knu-Vise pliers. Pliers open instantly re-clamp quickly—easily—without waste motion.

Maintains control over the free-swinging handle—permitting re-clamping with the same grip. Always remains within the hand span of the user.



Flip it over and you have instant release in the other direction. The Knu-Vise *insta-release* lever is available on P-1200 and P-1800 Series pliers.

Remember: Every model of the more than 150 *Knu-Vise* clamps is quick to lock—and quick to open. **Ask** for a demonstration.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS **LAPEER MANUFACTURING CO.**

3064 DAVISON ROAD • LAPEER, MICHIGAN

WESTERN DIVISION: 422 Magnolia, Glendale, California • CANADIAN DIVISION: Hegganson Engr., Hamilton, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 2114

SHOP AIDS

A New End Mill Speed Selector Wall Chart has been announced by The DoAll Co., Des Plaines, Ill. Listed are recommended surface speeds in fpm for most metals. These

figures are translated into rpm's for end mills of diameters ranging from 1/16" to 2 1/2". To obtain a copy of this wall chart, contact the company, or— **Circle Inform-A-Gram No. C1.**

A Battery Buying Guide, "So You're Going to Buy an Industrial Battery," has been issued by Gould-National Batteries, Inc., Trenton 7, N. J. A four-point program describes the importance of selecting the proper battery for the job, and the purpose of correct charging and handling. Three case histories are included to show the value of correct application engineering. Get pocket-size Booklet GB-1788 from the company, or — **Circle No. C2.**

A Honing Handbook describes how honing generates diametrically round and straight bores, automatically controlling size within tenths and producing a preselected degree of finish. It is complete with tables and charts for proper speed selection to obtain desired finishes in various materials. Included are instructions on how to calculate the work stroke for maximum honing efficiency. Complete discussion is also included of abrasive grades and grits, together with the analysis and effects of various types of cutting fluids. Copies of Catalog 550N are provided by Barnes Drill Co., Rockford, Ill., or — **Circle Inform-A-Gram No. C3.**

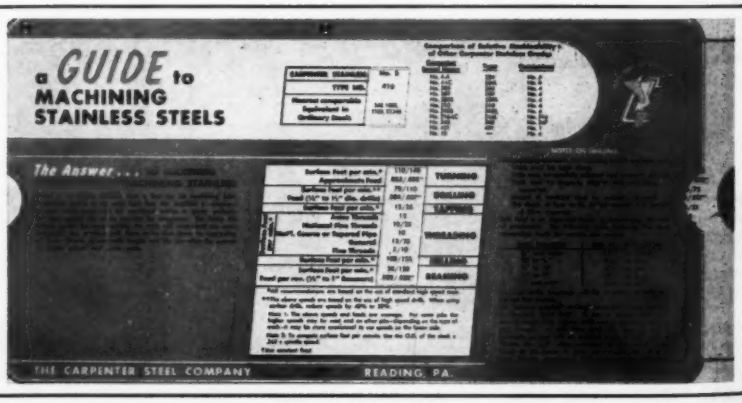
"An Engineering Handbook on Powder Metallurgy" describes the manufacture and use of powdered metal parts as revealed by experience and comprehensive research. Presented is technical data on the design, engineering, and application of bearings, machine parts, infiltrated parts, plated parts, and pole pieces made of powdered sintered metal. Discussed and illustrated are sizing the bore of sintered bearings, good design vs poor design practice, secondary machining operations and special requirements, and specifications of sintered metals. Also covered are supplemental lubrication, tools for machining, finished machine parts, dimensional tolerances, chamfers and fillets, and sintered metal gears. A large P.V. chart is shown with detailed instructions for use. Get copies of the handbook from The Bunting Brass and Bronze Co., Toledo 1, O., or — **Circle Inform-A-Gram No. C4.**

A Table of Constants is found in Catalog 257 recently released by Hanchett Magna-Lock Corp., 384 Maple St., Big Rapids, Mich. Shown and described is a complete line of magnetic chucks, holding devices, and accessories. **Circle Inform-A-Gram No. C5.**

A Manual of Stainless and High Alloy Pipe and Tubing can be obtained from Trent Tube Co., E. Troy, Wis. It covers Contour Trentweld tubing from 1/8" to 40" O.D. One section lists the types of Trentweld tubing that are available, complete with charts and tables applying to

each class. Another section is devoted to engineering data giving joining methods, welding and bending techniques, and installation hints. The final section of the manual is made up of tables. Direct requests for copies of the manual to the company, or — **Circle No. C6.**

This Pocket-Size Slide Chart on machining stainless steels is now available from The Carpenter Steel Co., 306 W. Bern St., Reading, Pa. On one side is given data on turning, drilling, tapping, threading, milling, and reaming operations. The chart tabulates speeds and feeds, and gives special notes on drilling, tapping, lubrication, and welding. On the other side of the chart is shown the relative workability of stainless steels in a wide variety of operations including blanking, deep drawing, stamping, forging, and heading. **Circle No. C7.**



PINPOINT MACHINE WEAR . . . MISMATED PARTS . . . WITH SPERRY BEARING TESTER

The Bearing Tester consists of a metal probe, or pickup, and a compact electronic amplifier. Any malfunctioning in a moving part is transmitted through the probe and shows itself by a change in the noise level and the noise pattern visually presented on the tester's calibrated dial. Lightweight, easily portable, the Sperry Bearing Tester is a positive asset to preventive maintenance, quality control, and receiving inspection.

Bulletin 61-105 describes the Sperry Bearing Tester. Write for your copy.

406 Shelter Rock Road Danbury, Connecticut

sperry products INC.

First in Ultrasonic Inspection

CIRCLE INFORM-A-GRAM KEY NO. 2131

TAP AND DEBURR IN ONE OPERATION

Slip a BURR-BIT onto any make tap and holes are automatically deburred while they are being tapped. Save money, time and labor by COMBINING TWO OPERATIONS INTO ONE.

AS TAP IS WITHDRAWN, BURR BIT DEBURRS, LEAVING CLEAN CHAMFER

First thread which creates burr, has been AUTOMATICALLY, QUICKLY AND PRECISELY REMOVED, leaving perfectly smooth finish for easy screw insertion.

Precisely engineered of finest quality high speed tool steel for use on almost every material. The BURR-BIT is used by many large and small manufacturers throughout the country.

For full information and specifications on the BURR BIT, write to

VERNON DEVICES, Inc.

481 E. 3rd Street Mt. Vernon, N.Y. MOunt Vernon 4-1686

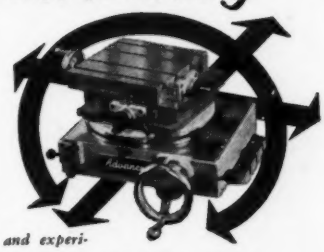
CIRCLE INFORM-A-GRAM KEY NO. 2133

Cut DIE MAKING COST!

30 Seconds Accuracy

Advance Cross-Slide Rotary Table

Permits fast, precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut . . . *Ideal for tools, dies, jigs, fixtures, gauges, patterns, molds, cams, templates, models and experimental work.*



Advance 15" Rotary Table

This rugged, precise tool is designed for all types of work requiring rotational accuracy. Its maximum speed and precision and minimum maintenance fills the need for a precision unit at a moderate price.

The best quality of materials and workmanship, combined with high accuracy, provide the user with a top quality precision tool.

FULL DETAILS ON REQUEST

MORRISON ENGINEERING COMPANY

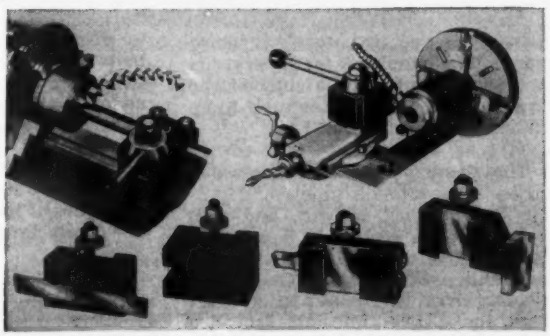
937 West Lake Street, Dept. A1, Chicago 7, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 2132

NOW! LATHE USERS CHANGE TOOLS in a . . . FLASH . .

ALORIS QUICK CHANGE TOOL POSTS & HOLDERS

Speed Your Operation . . . . Save You Money



Only a second to change tools for turning, facing, drilling, boring, threading, knurling, cutting off or any other operation.

- Great Repetitive Accuracy
- Greater Rigidity
- Rugged Construction
- Saves 90% in Set-Up Time
- Tested and Recommended by Leading Lathe Manufacturers
- Unconditionally Guaranteed

Write for catalog and price list.

ALORIS TOOL CO., INC. 131-37 SANFORD AVENUE FLUSHING 55, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 2134

Business Management Aids

Functional Background Work Music as an answer to worker tension is discussed in a booklet from Muzak Corp., 229 - 4th Ave., New York 3. Contained in the booklet are charts showing that when work music is

used, production goes up and errors go down. Also presented are worker efficiency curves. For further details, get a copy of the booklet, "An Answer . . . to Worker Tension," from the company, or — **Circle No. F1.**

Tests and Other Materials for Use in Personnel Selection and Training are described in the 1957 Industrial Catalog released by Science Research Associates, Industries Div'n, 57 W. Grand Ave., Chicago 10. Found in the catalog are tests of intelligence, interest, personality, aptitudes, and skills. Noted are the uses of the SRA Employee Inventory. In addition, a new handbook for supervisors is presented. Obtain a copy of the catalog from Science Research Associates, or — **Circle No. F2.**

The Credit Union Yearbook discusses what a credit union is, detailing the number, growth, and who belongs. One section is devoted to the Credit Union National Association and another to CUNA Supply Cooperative. The final section deals with the CUNA Mutual Insurance Society. As stated in the Yearbook, a credit union is made up of a group of people who agree to save their money together and to make loans to each other at low interest. For complete information, obtain a copy of the Yearbook from Credit Union National Association, Inc., 1617 Sherman Ave., P. O. Box 431, Madison 1, Wis., or — **Circle No. F3.**

"High-Speed Analog Computers, Key to Rapid System Development" is concerned with automation and the development of control systems for industrial and military applications. In question-and-answer style, the booklet defines certain types of computers and summarizes the applications of each. Also discussed are the advantages and limitations of high-speed analog computers as compared with real-time ones. In addition, the booklet notes the typical fields of application for high-speed computers. GPS Instrument Co., Inc., 811 Boylston St., Boston 16, will supply copies of the eight-page introduction to analog computation and the company's equipment, or — **Circle Inform-A-Gram No. F4.**

Office Photocopying is covered in a 16-page booklet prepared by American Photocopy Equipment Co., 1920 W. Peterson Ave., Chicago 26. The booklet explains office photocopying in detail and illustrates many applications for this development. To supplement the booklet, the company is also offering a series of business method studies that point out how present users of the Apeco Dial-A-Matic Auto-Stat are applying the machine to increase efficiency of operation. To obtain the literature, contact the company, or — **Circle Inform-A-Gram No. F5.**

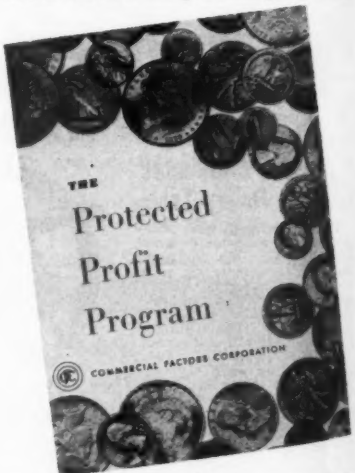
"Maximum Automation Potential," explains the new, free engineering service offered by The Carborundum Co., Coated Abrasives Div'n, Niagara Falls, N. Y. M-A-P is a method used to predict performance of abrasive belts on any metal removal operation (except snagging operations) in advance of any expenditure for materials or equipment. The study is made away from the customer's plant, based on a few basic production facts he supplies. Direct requests for copies of the brochure to the firm, or—**Circle Inform-A-Gram No. F6.**

Four Management Programs are being conducted May 13 through June 17 by the National Institute of Management, Inc., 1008 National City Bank Bldg., Cleveland 14. The programs deal with methods of improvement, work measurement, and standard data. One three-part seminar covers production control, inventory management, and inventory records. For further information, obtain a brochure from the Institute, or — **Circle Inform-A-Gram No. F7.**

A Data-File has been added to the line of vertical filing equipment produced by Plan Hold Corp., 5204 Chakemco St., South Gate, Calif. Holes and other mutilations are eliminated with the all aluminum Plan Hold friction type binders. Details are found in 12-page Catalog 6 made available by the company, or — **Circle Inform-A-Gram No. F8.**

"A Guide to Better Closures" is intended for users of fibreboard boxes and packages. The brochure describes the methods now being used to provide economies and stepped-up production in the closure of fibreboard boxes. The box referred to throughout the illustrated brochure is the Regular Slotted Container. Covered are machine and hand gluing, taping, stapling, and stitching. One section notes the regulations for sealing fibreboard containers. The final section is devoted to wire stitching showing its advantages over the other methods discussed. For complete details see the brochure issued by Acme Steel Co., 135th St. & Perry Ave., Chicago 27, or — **Circle Inform-A-Gram No. F9.**

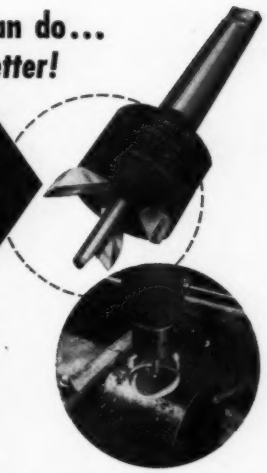
A Profit-Building Plan, which aids in expanding a business without increasing investment or risk, is detailed in "The Protected Profit Program". Among the subjects covered in the booklet are providing the cash



as needed, protecting against all credit losses, promoting maximum operating effectiveness, and providing constructive market counselling. Get your copy of the booklet from Commercial Factors Corp., 2 Park Ave., New York 16, or — **Circle Inform-A-Gram No. F10.**

Does jobs no drill can do... Does many jobs *better!*

Clark "HOLE-MAKER"



Produces round, true holes in CASTINGS, FORGINGS, BOILER PLATE, THIN SHEET STOCK, PIPE, TUBING, ETC.; Drills CROWNED, CYLINDRICAL, FLAT OR WEBBED SURFACES!

No triangular shaped holes, no grabbing on break-throughs, no "walking" on starts with the Clark "HOLE-MAKER"! Produces full-gauge holes from start to finish. Removable pilot guides HOLE-MAKER straight and true even on intermittent cuts. Will also use pilot drill.

Ideal production tool on TURRET LATHES, CHUCKING MACHINES, RADIAL DRILLS, DRILL PRESSES, PORTABLE ELECTRIC and PNEUMATIC DRILLS. Excellent for rough boring, finishing and trepanning. Cuts all ferrous and non-ferrous metals and other materials. Saves money, replaces large drill inventory... Bores castings, forgings, etc. 3 to 10 times faster than single pointing!

5 ADJUSTABLE SIZES COVER I.D.'s from 1" to 6"

Specify straight shank or MT 2, 3, 4. Other tapers on order.

MODEL	CAPACITY
102	1"–2"
203	2"–3"
304	3"–4"
405	4"–5"
506	5"–6"

When ordering, specify material to be cut.

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd., Beverly Hills, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 2151

NO REVERSE LEVER! WON'T STICK! .075 TRAVEL! RUGGED!

PEARSON DIAL INDICATOR

wears IN, instead of wearing out!

A highly sensitive, easy-to-read finger-type indicator that will read either direction *without reverse lever* or clumsy gear shifting. Will accurately *repeat within .0001*. The *extra long contact point* makes it more accessible and versatile. Unconditional lifetime guarantee. WRITE TODAY FOR COMPLETE DETAILS.

INTERNATIONAL INSIDE MICROMETER

Improved, highly accurate with new 1½" feature permitting use in small diameters.

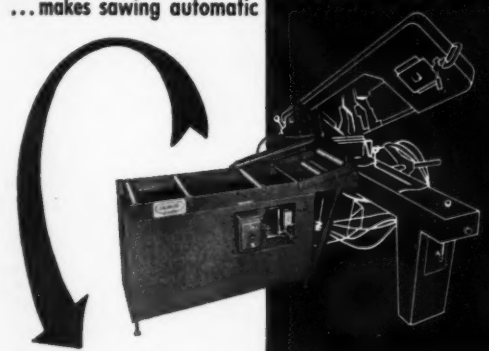
WRITE TODAY! **M & G INSTRUMENT CO.**
Dept. 18, 12940 Saticoy Street, North Hollywood, California

DEALER INQUIRIES INVITED

CIRCLE INFORM-A-GRAM KEY NO. 2153

The **KALAMATIC** ...makes sawing automatic

AUTOMATIC BAR-FEED ATTACHMENT



Featuring:

- **Quick easy installation and adjustment.**
- **Accurate repetitive cutting with no intricate electrical equipment to go out of balance.**
- **Completely enclosed oil tank and ball bearing table rollers.**

The Kalamatic automatically feeds rounds, flats, hex, pipe, tubing to most Kalamazoo metal cutting band saws—any length from 3/16" to 30". Thoroughly automatic, The Kalamatic helps prolong the blade life of the saw.

Machine Tool Division
Kalamazoo
TANK and SILO CO.
508 HARRISON ST.
KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 2152

WILL STAMPINGS DO YOUR JOB BETTER?

Redesign from casting to stamping cuts piece price 66%...tooling cost 53%

★**BREAKAGE ELIMINATED**—Wrought aluminum alloy gives greater strength characteristics, eliminating breakage which occurred with the original cast part.

★**MACHINING ELIMINATED**—Blanked and pierced part is complete as pictured. No additional machining of holes or top and bottom surfaces is required. End result is a better part at lower cost.

★**COST REDUCED**—Piece price reduced 66%. Original cost of the casting plus necessary machining was $1.45 each in lots of 1000. *Cost of stamping is 50¢ each.*

Tooling cost reduced 53%. Original cost of pattern and drill jig was $301.00. *Tooling for stamping cost $140.00.*

WILL STAMPINGS DO YOUR JOB BETTER?
Analyze your production parts and check with...

DAYTON ROGERS *Manufacturing Company*

CIRCLE INFORM-A-GRAM KEY NO. 2154

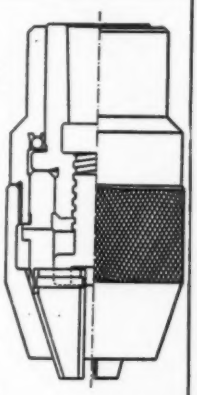
THE RAPID

A Superior Swedish Drill Chuck

For the finest JIG BORERS or other machines

WHEREVER UTMOST AVAILABLE ACCURACY COUNTS

- Automatic tightening and self centering with load
- Easy to open — *No Key* to misplace or to invite accidents
- No chewed up tool shanks
- All parts properly hardened and Precision Ground
- Arbors Precision Ground between centers



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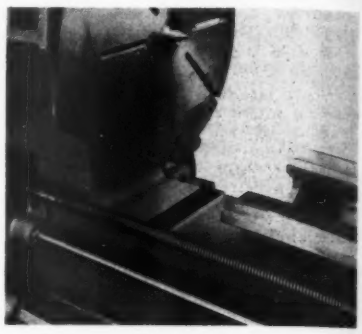

Block removed. Note planed ways, bolt and dowel holes for seating the removable block and assuring perfect alignment of block with fixed bed.

Block in place. Note "gap" intentionally left for swinging the large face plate which can now be used for all chucking jobs, making it unnecessary to switch to small face plate.

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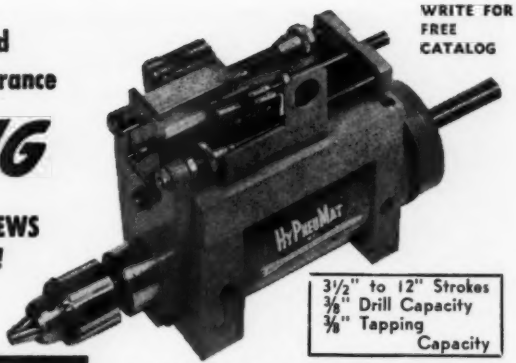

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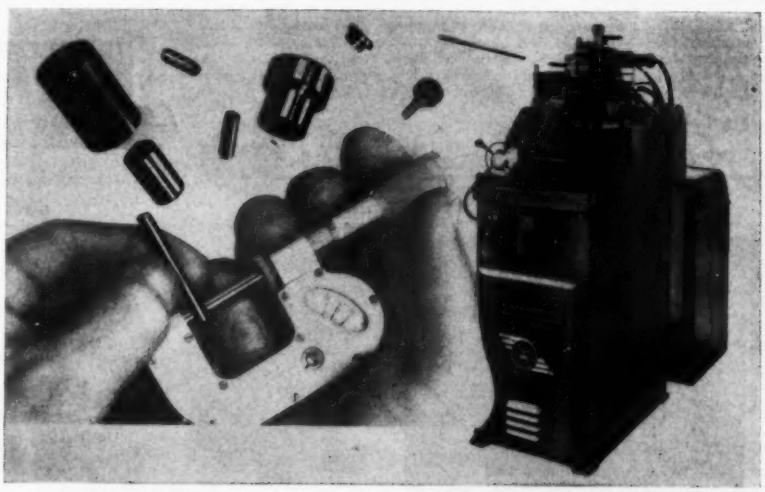

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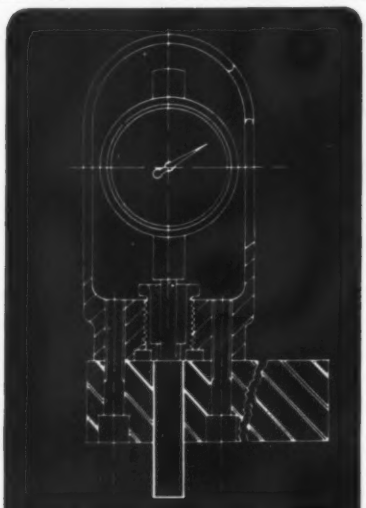

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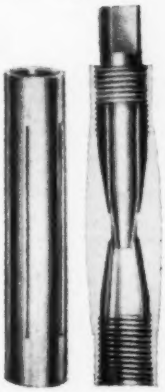

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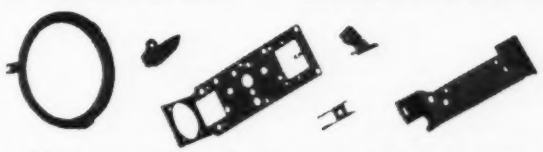

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TOOLING & PRODUCTION Magazine

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This cumulative index will build up progressively during each calendar year. Each issue will carry a cumulative index of material contained in all previous issues of the same year, with each January issue carrying the complete index of the twelve issues of the previous year.

We suggest you see to it that your copies of T&P are retained for future reference so you can get the full benefit of this new, unique and useful index.

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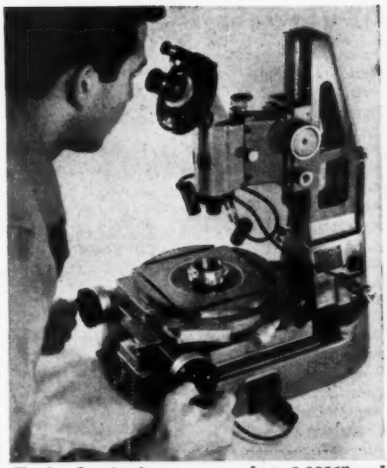

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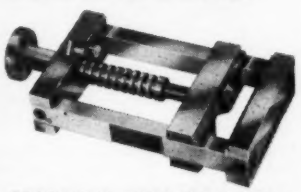

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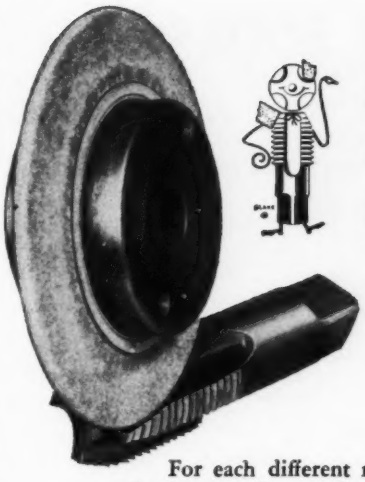

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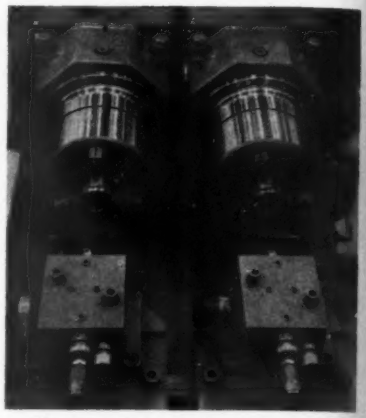

Close-up of the tooling arrangement in the style 308 machine. One tool in each holder performs a complete operation. Three jaw, air-operated chucks hold the parts during the machine cycle.

machine. Actuating the table and cross slide of the unit, the cams initiate and regulate all machining operations.

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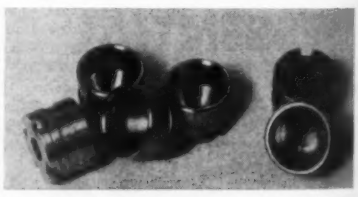

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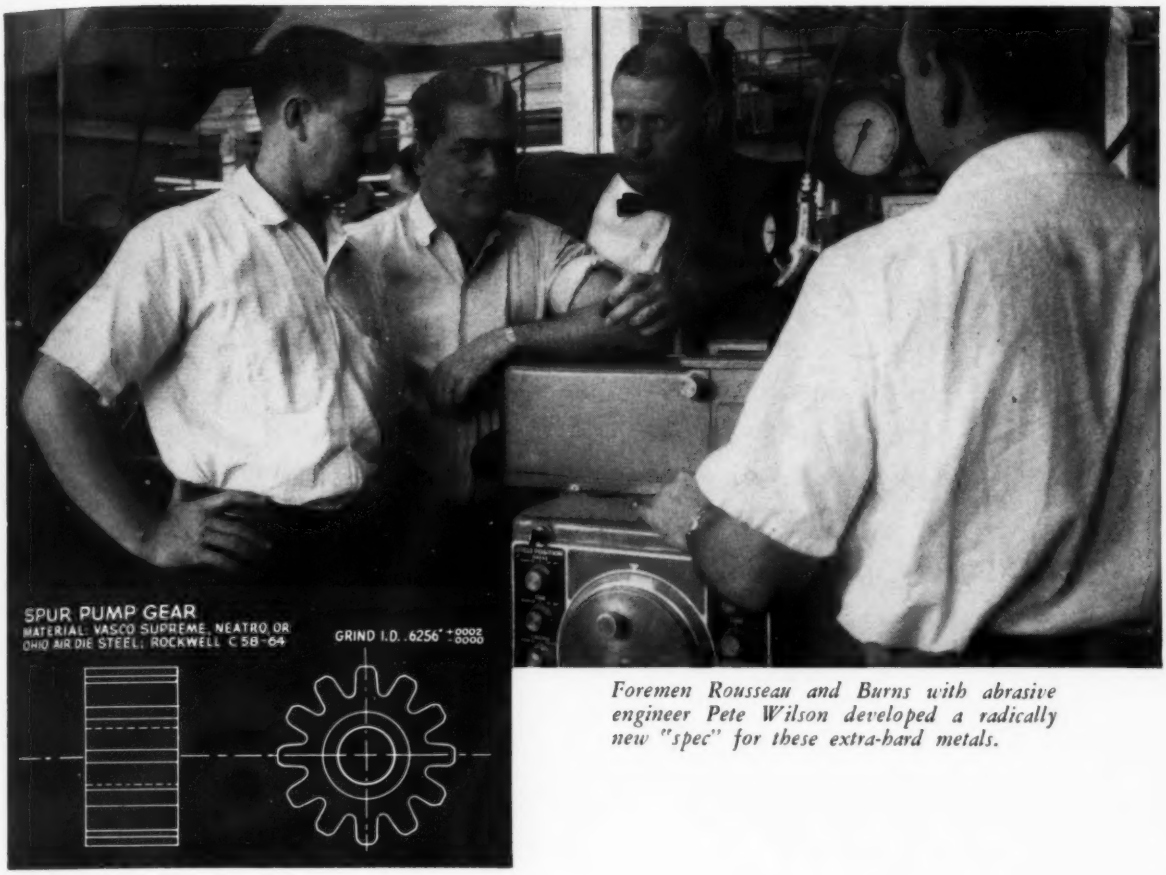

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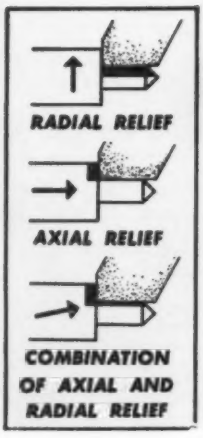

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